Rock Products

TRADEPRESS PUBLISHING CORPORATION
542 SOUTH DEARBORN STREET
CHICAGO

NATHAN C. ROCKWOOD, Editor CHAS. H. FULLER, Manager C. F. TREFZ, Associate Editor

Vol. XXIII, No. 5 February 28, 1920

Printing of this issue, 4,000 copies

Second class entry at U. S. Post Office.

Table of Contents

Labor Saving in Mining and Handling Silica Sand....13, 14
Electric Locomotives for Quarry and Gravel Plant Operation....15, 16, 17, 18, 19, 20
Increasing the Output of Crushed Stone Plants....21, 22, 23
Notes on the Annual Convention of the National Crushed Stone Association 24
Raising the Dignity of Quarry Products.... 25
Hints and Helps for the Plant Superintendent....26, 27
General News of the Rock Products Industries....28, 29
Problems of the Plaster Industry....30, 31
Cement Production in 1919....32, 33
Convention of the Associated General Contractors.... 34
Secret of Success in Sand and Gravel Pumping....35, 36
New President of the National Association of Sand and Gravel Producers.... 37
Notes on the National Sand and Gravel Convention....38, 39
Editorial Page 40
Accident Prevention in the Rock Products Industries.... 41
New Equipment and Machinery 42
General News of the Rock Products Markets.... 43
Current Wholesale Prices of Rock Products....44, 45, 46
General News of the Rock Products Markets.... 47
Passed by the Screens 48, 49, 50

ALPHABETICAL LIST OF ADVERTISERS

Advance Engineering Co., The.... 55
Aero Pulverizer Co.... 65
Aetna Explosives Co.... 6
Allis-Chalmers Mfg. Co.... 64
American Hoist & Derrick Co.... 11
American Process Co....Inside front cover
American Pulverizer Co....Inside back cover
American Steel & Wire Co.... 55
American Well Works.... 60
Atlas Car & Mfg. Co.... 60
Audubon Wire Cloth Co.... 64
Austin Mfg. Co.... 65

Baldwin Locomotive Works.... 54
Ball Engine Co.... 61
Bates Valve Bag Co.... 66
Beaumont Mfg. Co.... 63
Bradley Pulverizer Co.... 62
Browning Co., The.... 54
Buchanan Co., C. G.... 66
Buckbee, J. C., Co.... 62
Butterworth & Lowe.... 58
Byers Machine Co., John F.... 67

Cable Excavator Co....Inside front cover
Central Frog & Switch Co.... 55
Chalmers & Williams.... 76
Chapman Eng. Co.... 68
Chicago Perforating Co.... 54
Cincinnati Rubber Co.... 68
Classified Advertising.... 53
Classified Business Directory.... 74
Cross Eng. Co.... 57

Easton Car & Construction Co.... 54
Ehrsam & Sons Co., J. B.... 54
Ensign-Bickford Co.... 69
Erie Steam Shovel Co.... 61

Fate-Root-Heath Co.... 3
Fuller Engineering Co.... 54
Fuller-Lehigh Co.... 60

Gifford-Wood Co.... 58
Goodyear Tire & Rubber Co., The 5

Hendrick Mfg. Co.... 60
Hunt, R. W. & Co.... 55

International Clay Machy. Co.... 61

Jaite Co., The....Inside front cover
Jeffrey Mfg. Co., The.... 4
Johnston & Chapman.... 59

K-B Pulverizer Co., Inc.... 59
K. C. Hay Press & Tractor Co.... 67
Kennedy Van Saun Mfg. & Eng. Corp.... 56
Kent Mill Co.... 69

Leschen & Sons Rope Co., A....Inside back cover
Lewistown Fdy. & Mach. Co.... 54
Lima Locomotive Works.... 70
Link-Belt Co....Back cover

Mayer-Hasseldiek Mfg. Co.... 54
McLanahan-Stone Machine Co.... 56
McMyler Interstate Co.... 56
Miscampbell, H.... 71
Morris Machine Works.... 70

National Engineering Co.... 61
New Jersey Wire Cloth Co.... 63
New York Belting & Packing Co.... 1

Ohio Locomotive Crane Co.... 57
Osgood Co., The.... 57
Owen Bucket Co.... 75

Pennsylvania Crusher Co....Inside front cover
Porter Co., H. K.... 55

Raymond Bros., Impact Pulv. Co.... 71
Robins Conveying Belt Co.... 55
Ruggles Coles Eng. Co....Inside front cover

Sanderson Cyclone Drill Co. Front cover
Sauerman Bros.... 55
Schaffer Eng. & Equip. Co.... 72
Smidth, F. L., & Co.... 55
Smith Eng. Works.... 10
Steacy-Schmidt Mfg. Co....Inside front cover
Stephens-Adamson Mfg. Co.... 75
Stimpson Equip. Co.... 73
Sturtevant Mill Co.... 12

Track Equipment Co.... 57
Traylor Eng. & Mfg. Co.... 72

United States Chain & Forging Co. 58
Universal Crusher Co.... 61
Universal Road Mach. Co....Inside back cover
Used Equipment....50-51-52

Vulcan Iron Works.... 63

Watt Mining Car Wheel Co.... 62
Webb City & Carterville Foundry & Machine Works.... 59
Webster Mfg. Co.... 7
Weller Mfg. Co.... 73
Whitcomb Co., Geo. D.... 59
Williams, C. K. & Co.... 56
Williams Patent Crusher Co.... 58
Worthington Pump & Mach. Co.... 8-9

PUBLISHED EVERY OTHER SATURDAY by the Tradepress Publishing Corporation, 542 South Dearborn St., Chicago, Ill., U. S. A. W. D. Callender, president; T. J. Sullivan, vice-president; George P. Miller, Treas.; C. H. Fuller, Secy.

SUBSCRIPTION

$2 a year in United States; $3 a year, Canada and foreign. Single copies, 20 cents. Date on wrappers indicates issue with which your subscription expires. In writing to have address changed, give old as well as new address.

Entered as second class matter July 2, 1907, at the Postoffice at Chicago; under act of March 3, 1879.

Rock Products

TRADEPRESS PUBLISHING CORPORATION
542 SOUTH DEARBORN STREET
CHICAGO

NATHAN C. ROCKWOOD, Editor CHAS. H. FULLER, Manager C. F. TREFZ, Associate Editor

Vol. XXIII, No. 5 February 28, 1920

Printing of this issue, 4,000 copies

Second class entry at U. S. Post Office.

Table of Contents

Labor Saving in Mining and Handling Silica Sand....13, 14
Electric Locomotives for Quarry and Gravel Plant Operation....15, 16, 17, 18, 19, 20
Increasing the Output of Crushed Stone Plants....21, 22, 23
Notes on the Annual Convention of the National Crushed Stone Association 24
Raising the Dignity of Quarry Products.... 25
Hints and Helps for the Plant Superintendent....26, 27
General News of the Rock Products Industries....28, 29
Problems of the Plaster Industry....30, 31
Cement Production in 1919....32, 33
Convention of the Associated General Contractors.... 34
Secret of Success in Sand and Gravel Pumping....35, 36
New President of the National Association of Sand and Gravel Producers.... 37
Notes on the National Sand and Gravel Convention....38, 39
Editorial Page 40
Accident Prevention in the Rock Products Industries.... 41
New Equipment and Machinery 42
General News of the Rock Products Markets.... 43
Current Wholesale Prices of Rock Products....44, 45, 46
General News of the Rock Products Markets.... 47
Passed by the Screens 48, 49, 50

ALPHABETICAL LIST OF ADVERTISERS

Advance Engineering Co., The.... 55
Aero Pulverizer Co.... 65
Aetna Explosives Co.... 6
Allis-Chalmers Mfg. Co.... 64
American Hoist & Derrick Co.... 11
American Process Co....Inside front cover
American Pulverizer Co....Inside back cover
American Steel & Wire Co.... 55
American Well Works.... 60
Atlas Car & Mfg. Co.... 60
Audubon Wire Cloth Co.... 64
Austin Mfg. Co.... 65

Baldwin Locomotive Works.... 54
Ball Engine Co.... 61
Bates Valve Bag Co.... 66
Beaumont Mfg. Co.... 63
Bradley Pulverizer Co.... 62
Browning Co., The.... 54
Buchanan Co., C. G.... 66
Buckbee, J. C., Co.... 62
Butterworth & Lowe.... 58
Byers Machine Co., John F.... 67

Cable Excavator Co....Inside front cover
Central Frog & Switch Co.... 55
Chalmers & Williams.... 76
Chapman Eng. Co.... 68
Chicago Perforating Co.... 54
Cincinnati Rubber Co.... 68
Classified Advertising.... 53
Classified Business Directory.... 74
Cross Eng. Co.... 57

Easton Car & Construction Co.... 54
Ehrsam & Sons Co., J. B.... 54
Ensign-Bickford Co.... 69
Erie Steam Shovel Co.... 61

Fate-Root-Heath Co.... 3
Fuller Engineering Co.... 54
Fuller-Lehigh Co.... 60

Gifford-Wood Co.... 58
Goodyear Tire & Rubber Co., The 5

Hendrick Mfg. Co.... 60
Hunt, R. W. & Co.... 55

International Clay Machy. Co.... 61

Jaite Co., The....Inside front cover
Jeffrey Mfg. Co., The.... 4
Johnston & Chapman.... 59

K-B Pulverizer Co., Inc.... 59
K. C. Hay Press & Tractor Co.... 67
Kennedy Van Saun Mfg. & Eng. Corp.... 56
Kent Mill Co.... 69

Leschen & Sons Rope Co., A....Inside back cover
Lewistown Fdy. & Mach. Co.... 54
Lima Locomotive Works.... 70
Link-Belt Co....Back cover

Mayer-Hasseldiek Mfg. Co.... 54
McLanahan-Stone Machine Co.... 56
McMyler Interstate Co.... 56
Miscampbell, H.... 71
Morris Machine Works.... 70

National Engineering Co.... 61
New Jersey Wire Cloth Co.... 63
New York Belting & Packing Co.... 1

Ohio Locomotive Crane Co.... 57
Osgood Co., The.... 57
Owen Bucket Co.... 75

Pennsylvania Crusher Co....Inside front cover
Porter Co., H. K.... 55

Raymond Bros., Impact Pulv. Co.... 71
Robins Conveying Belt Co.... 55
Ruggles Coles Eng. Co....Inside front cover

Sanderson Cyclone Drill Co. Front cover
Sauerman Bros.... 55
Schaffer Eng. & Equip. Co.... 72
Smidth, F. L., & Co.... 55
Smith Eng. Works.... 10
Steacy-Schmidt Mfg. Co....Inside front cover
Stephens-Adamson Mfg. Co.... 75
Stimpson Equip. Co.... 73
Sturtevant Mill Co.... 12

Track Equipment Co.... 57
Traylor Eng. & Mfg. Co.... 72

United States Chain & Forging Co. 58
Universal Crusher Co.... 61
Universal Road Mach. Co....Inside back cover
Used Equipment....50-51-52

Vulcan Iron Works.... 63

Watt Mining Car Wheel Co.... 62
Webb City & Carterville Foundry & Machine Works.... 59
Webster Mfg. Co.... 7
Weller Mfg. Co.... 73
Whitcomb Co., Geo. D.... 59
Williams, C. K. & Co.... 56
Williams Patent Crusher Co.... 58
Worthington Pump & Mach. Co.... 8-9

PUBLISHED EVERY OTHER SATURDAY by the Tradepress Publishing Corporation, 542 South Dearborn St., Chicago, Ill., U. S. A. W. D. Callender, president; T. J. Sullivan, vice-president; George P. Miller, Treas.; C. H. Fuller, Secy.

SUBSCRIPTION

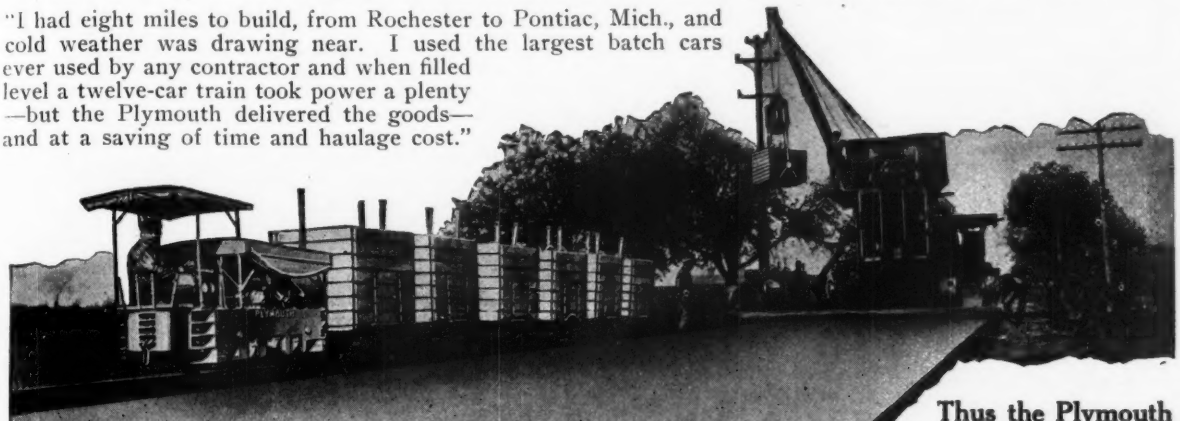
$2 a year in United States; $3 a year, Canada and foreign. Single copies, 20 cents. Date on wrappers indicates issue with which your subscription expires. In writing to have address changed, give old as well as new address.

Entered as second class matter July 2, 1907, at the Postoffice at Chicago; under act of March 3, 1879.

A BIG JOB Well done

Geo. P. Scharl, the contractor on the road shown here, gladly tells of the great help of two Plymouth Gasoline Locomotives in hauling the road material four miles

"I had eight miles to build, from Rochester to Pontiac, Mich., and cold weather was drawing near. I used the largest batch cars ever used by any contractor and when filled level a twelve-car train took power a plenty —but the Plymouth delivered the goods— and at a saving of time and haulage cost."



Thus the Plymouth Makes Good

Wherever tracks can be laid, "Plymouth" haulage is a success. Every user reports the same economic saving results about

PLYMOUTH

Gasoline Locomotives

Simple of operation—upkeep cost very low—ready for rugged service every day — a sturdy giant of power — with a steady, even pull, forward or backward.

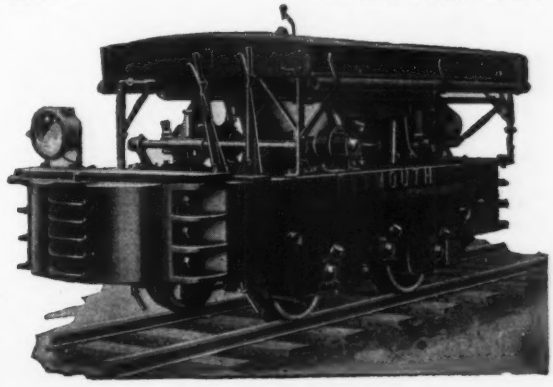
"PLYMOUTH" Haulage is a Proven Success

Underground—Surface and Elevated. "Plymouth" haulage is an investment that saves man power, dollars and time—Write for information—Tell us your problem—Illustrated Catalog showing many phases of "Plymouth" Haulage sent upon request.

Representatives in All Principal Cities of America

THE FATE-ROOT-HEATH CO.

210 RIGGS AVENUE PLYMOUTH, OHIO



OVER HALF BILLION DOLLARS

For Road Building for 1920. More Than the Cost of the Panama Canal

Almost five times that of last year—Five times the opportunity to secure contracts.

Contractors must be on the alert if this appropriation is to be used up.

Speedy construction alone will bring this sum into use. And the PLYMOUTH GASOLINE LOCOMOTIVE is one of the units of speed, with less man power—more work at less cost. The contractor who employs equipment that results in such saving will reap a harvest.

Here's the Loader That Road Builders, Contractors, Pit and Quarry Owners, Manufacturers and Others Have Been Waiting For

The Jeffrey

Type "K"

RADIAL LOADER

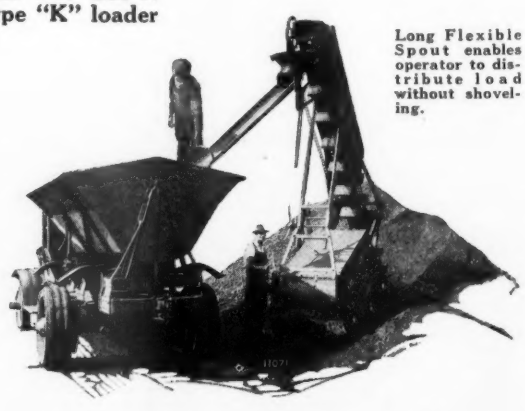
For Rapidly Handling sand, gravel, crushed stone, slag, ashes, coal, coke and other loose materials.

Three Wheel Support—will turn a complete circle with either drive wheel as a center.

Built for Heaviest Work—large wheels enable it to pass over soft, rough or uneven ground.

Digs 8 to 10 feet into the pile—clear up to its driving wheels.

Write for new Bulletin No. 288-N fully describing the Type "K" loader



Long Flexible Spout enables operator to distribute load without shoveling.

The Jeffrey Mfg. Co.

935 N. Fourth Street Columbus, Ohio

BRANCH OFFICES

New York
Boston
Detroit
Philadelphia
Seattle
Los Angeles
Pittsburgh
Cleveland
Chicago
St. Louis
Scranton
Charleston, W. Va.
Milwaukee
Birmingham
Dallas
Denver
Montreal

Handle it Mechanically

Copyright 1920, by The Goodyear Tire & Rubber Co.

The Best Hose in the Shipyard

"The hose made by you for us has shown a 'life' ranging from 18 to 24 months and has surpassed our technical requirements and excelled all hose used or tested by us."

Goodyear Wingfoot Air Hose earned in service and under various tests the commendation quoted above from the report of the Head of the Standards Department, Merchant Shipbuilding Corporation, Chester, Pa.

Its record of achievement dates back to the time when the Merchant Shipbuilding Corporation was The Chester Shipbuilding Co., Ltd., and the yards were working night and day to build the bridge of ships to France.

Noting the undependable nature of many kinds of hose, and the wasteful, costly yard practices in which hose was abused, the Company sought relief from its hose troubles by creating a standard of hose specification.

The standards set included ability to carry 100 lbs. pressure per square inch and a life of at least 18 months. The Goodyear Tire & Rubber Company, which had helped work out the standards, supplied Goodyear Wingfoot Air Hose to meet the requirements.

Many thousands of feet of Goodyear Wingfoot Air Hose have been and are being used by the Merchant Shipbuilding Corporation. They have put Goodyear Wingfoot to every conceivable yard service test, and in addition have subjected it to special trials at the Altoona shops of the Pennsylvania Railroad, noted for their hose-testing equipment.

The result of all this experience is an outright endorsement of Goodyear Wingfoot Air Hose above all other kinds. Goodyear Wingfoot Air Hose excels in strength, in lightness, in ability to resist oil and to withstand abrasion, and in economical operation throughout a long life.

For further information write to the Mechanical Goods Dept., The Goodyear Tire & Rubber Co., Akron, Ohio.

GOODYEAR

AIR HOSE

Are you getting the rock out at *Lowest Cost?*

IN these days of high operating costs it is important to know exactly how much you are paying for every ton of rock—and whether that figure represents the *lowest possible cost.*

Hundreds of quarries that calculate their costs on a scientific basis (the only way they ought to be figured) are saving money by using

AETNA EXPLOSIVES

You get maximum tonnage with Aetna Explosives because they are manufactured according to the highest standards. No variation in quality or power. The full punch is back of every shot.

Aetna Explosives reach their highest point of efficiency when used according to the formulas worked out by our Engineering Department and in connection with Lion Electric Blasting Machines and Lion Electric Blasting Caps.

AETNA EXPLOSIVES COMPANY
Incorporated
165 Broadway, New York

BRANCHES

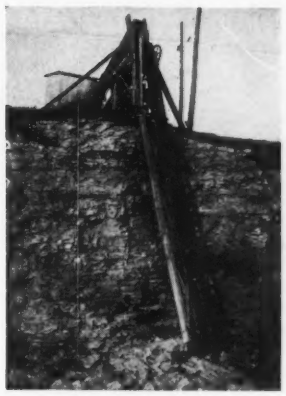
Birmingham, Ala.
Buffalo, N. Y.
Chicago, Ill.
Denver, Colo.
Duluth, Minn.
Joplin, Mo.
Louisville, Ky.
New Orleans, La.
Norristown, Pa.
Pittsburgh, Pa.
Pottsville, Pa.
Roanoke, Va.
St. Louis, Mo.
Wilkesbarre, Pa.

It does the work!

AETNA

Webster Machinery

For Elevating and Conveying in Quarries



Webster Bucket Elevator from Quarry to Cars

And in Sand and Gravel Plants

This company does more than manufacture good machinery.

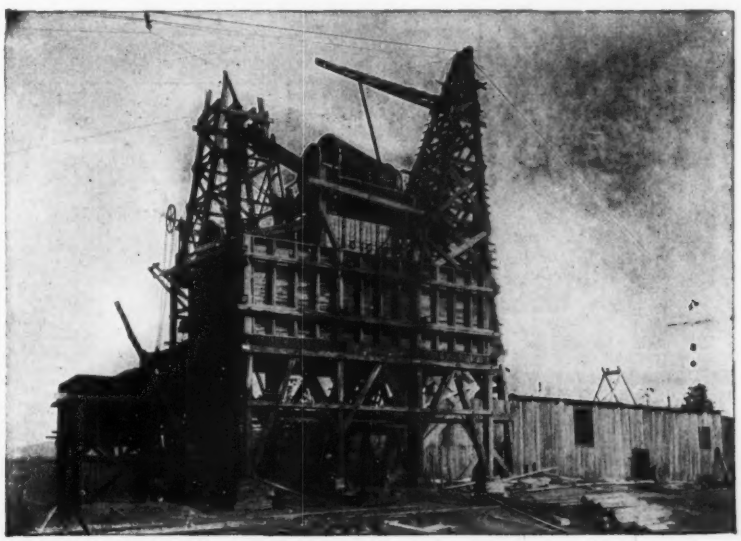
Our engineers render the buyer of Webster Equipment a far reaching service.

The physical conditions of each sand and gravel plant site are studied.

Plants are designed that will do the work required at a minimum cost and in the most effective way.

The same form of service applies to elevating and conveying machinery for cement and chemical plants.

Upon request and without obligation to you, Webster Engineers will study your requirements and make recommendations.



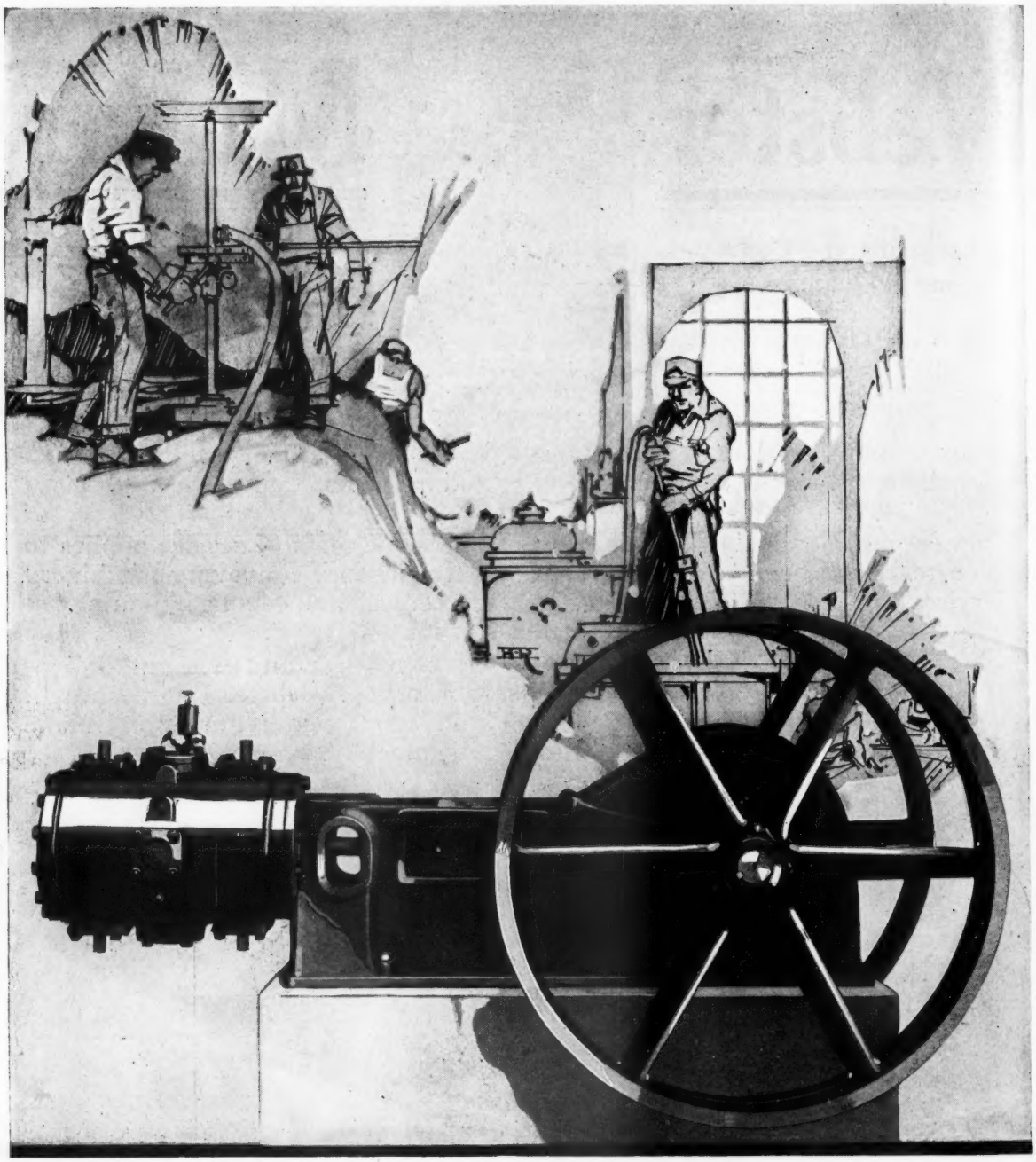
(286)

THE WEBSTER M'F'G COMPANY, TIFFIN, OHIO

New York Boston Cincinnati Chicago

Sand and Gravel Plant Machinery, Screens, Conveyors, Feeders, Drives, Friction Clutches, Etc., Etc.

When writing advertisers please mention ROCK PRODUCTS



PUMPS — COMPRESSORS — CONDENSERS — OIL & GAS ENGINES

WORTHINGTON

Deane Works, *Holyoke, Mass.*
Blake & Knowles Works
East Cambridge, Mass.
Worthington Works
Harrison, N. J.

Epping-Carpenter, *Pittsburgh, Pa.*

Laidlaw Works, *Cincinnati, Ohio.*

Gas Engine Works, *Cudahy, Wis.*
Power & Mining Works
Cudahy, Wis.
Snow-Holly Works
Buffalo, N. Y.

When writing advertisers please mention ROCK PRODUCTS

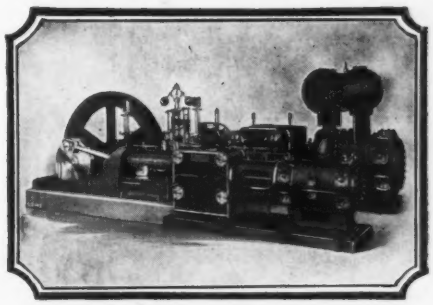
Worthington Feather Valve Air Compressors

WHENEVER steady, always ready compressed air service is needed—Worthington meets the call. And as the line pressure is dependent upon the compressor, so is the compressor dependent upon its valves for efficient service and performance.

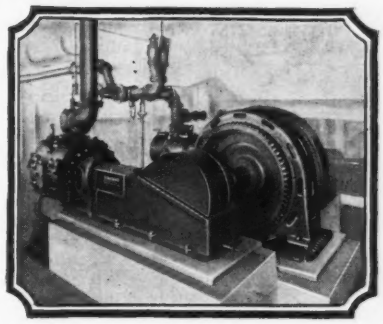
Worthington Air Compressors have been standardized with Feather Valves—the simplest, lightest, most efficient valve ever developed for air compressor work.

Worthington Feather Valve Air Compressors, then, are the most highly developed apparatus for air compressor work, even as Worthington products are standard in their various fields

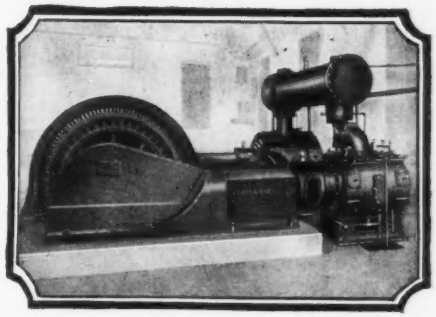
WORTHINGTON PUMP AND MACHINERY CORPORATION
Executive Offices: 115 Broadway, New York City
Branch Offices in 24 Large Cities



Cross Compound Two-Stage Feather Valve Compressor



Direct Connected Worthington Feather Valve Air Compressor



Direct Connected Worthington Feather Valve Air Compressor

METERS—MINING—ROCK CRUSHING & CEMENT MACHINERY

WORTHINGTON

Deane Works, *Holyoke, Mass.* Epping-Carpenter, *Pittsburgh, Pa.* Laidlaw Works, *Cincinnati, Ohio.* Gas Engine Works, *Cudahy, Wis.*
Blake & Knowles Works *East Cambridge, Mass.*
Worthington Works *Harrison, N. J.*
Power & Mining Works *Cudahy, Wis.*
Snow-Holly Works *Buffalo, N. Y.*

TELSMITH—

A Crusher of Proven Ability

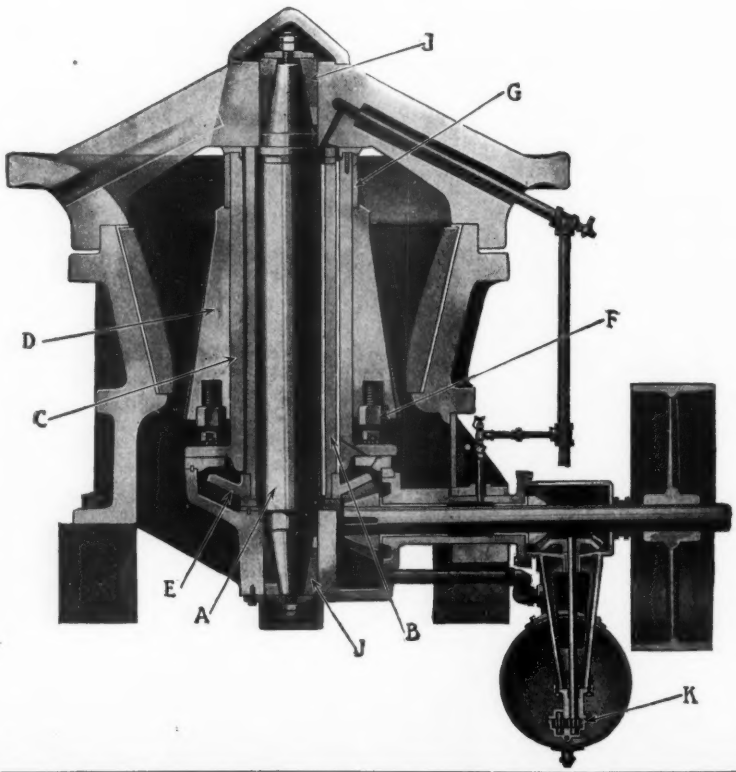
On March 2, 1914, a No. 6 Telsmith Primary Breaker was shipped to the Hainesport Mining & Transportation Co., Beach & Berks Sts., Philadelphia, Pa. It was put right to work crushing big, hard river boulders dredged out of the Susquehanna River—the kind that slip and jump, that break shafts and wear out heads. That's the sort of stuff that soon shows up what a rock breaker is really good for. Evidently Telsmith made good, for a No. 7½ was ordered in 1916 and still another was purchased in January of this year.

Such indorsements do not come easy. They are the reward of long, reliable service. The Telsmith parallel pinch, unbreakable bolt-shaft, short, rigid structure and big eccentric bearings are the features that make such service an ordinary, every-day matter.

Telsmith is a sturdy, faithful piece of machinery, that any quarry man may be proud to own. Our literature is yours for the asking—Catalog No. 166 (coarse crushers) and Bulletin No. 2F11 (secondary crushers). Write for them.

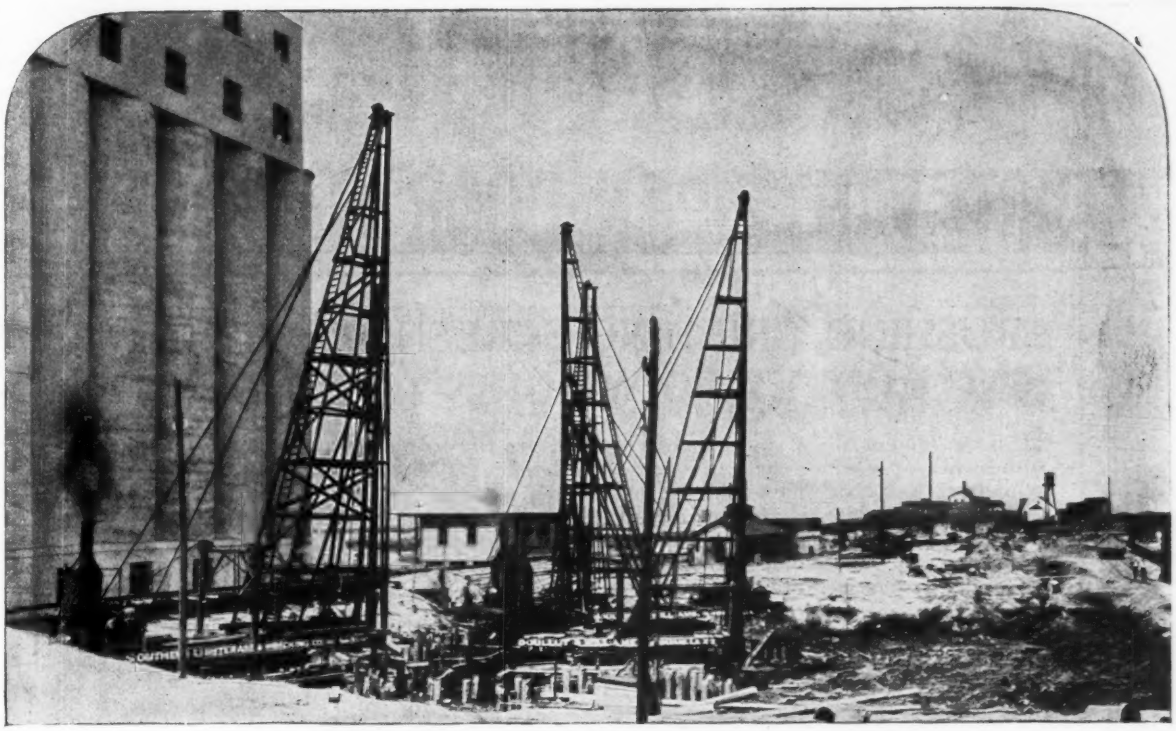
SMITH ENGINEERING WORKS

3188 Locust Street **Milwaukee, Wisconsin**



Local Offices:

Old Colony Bldg., Chicago, Ill.
30 Church St., New York City.
710 Witherspoon Bldg., Philadelphia, Pa.
930 Oliver Bldg., Boston, Mass.
110 W. Park Way, N. S., Pittsburgh, Pa.
325 W. Main St., Louisville, Ky.
208 N. 3rd St., Columbus, Ohio.
2540 University Ave., St. Paul, Minn.
Franklin and Channing Aves., St. Louis, Mo.
Salt Lake Hardware Co., Salt Lake City, Utah.
Road Builders Equipment Co., Portland, Ore.
625 Market St., San Francisco, Calif.
Watson Jack & Co., Montreal, P. Q.



Another "AMERICAN" Low-Cost-Fast-Time Record

Eighteen "AMERICAN" Hoisting Engines drove all the piling, excavated all the material and placed all the forms and concrete for the 1,600,000 bushel addition to the Public Grain Elevator at New Orleans.

In the face of wartime labor scarcity and universal high prices the work progressed with remarkable speed and the costs were held down so effectually, that the contractor was able to pay his men wages attractive enough to induce them to stay on the job.

Before actual construction work was begun, an "AMERICAN" Locomotive Crane, working night and day stored enough material to insure that there would be no halt in the work due to shortage of materials.

No matter where you are, an "AMERICAN" representative can reach you in twenty-four hours.

"Give me where I may stand and I will move the world."

American Hoist & Derrick Co.

Saint Paul Minnesota

Builders of "AMERICAN"

Hoisting Engines	Locomotive Cranes	Sugar Cane Machinery
Electric Hoists	Railroad Ditchers	Marine Deck Machinery and Tackle
Derricks	Logging Equipment	The Genuine "CROSBY" Wire Rope Clip

New York Chicago Pittsburgh Seattle New Orleans Detroit

AMERICAN HOIST & DERRICK CO.

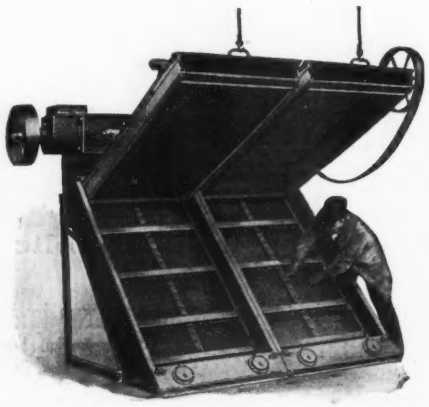
"ONE MAN – ONE MINUTE"

STURTEVANT "OPEN-DOOR" MACHINERY

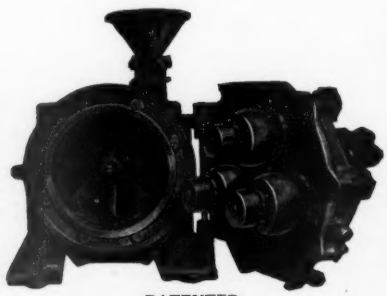
CRUSHING, GRINDING, SCREENING, ELEVATING, CONVEYING, WEIGHING AND MIXING

No one doubts the saving effected by the Open Door which allows one man to do the work of a whole gang of men and in less time. Minutes replace hours. One man replaces many men—shut-downs, for replacements, inspection or cleaning, are short. Production is almost continuous, non-productive "waiting" labor is eliminated; overtime and Sunday work are not necessary, all because everything is quickly accessible. The parts are easy to get at—the machines therefore can be kept in perfect condition for maximum outputs.

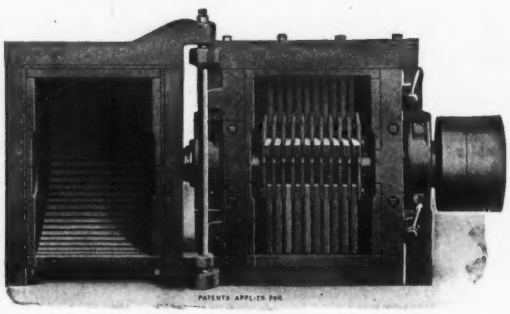
If trouble occurs it is instantly found and remedied through the Open Doors—the machines do not have to be taken apart by experts and valuable time lost. Just swing the door open, exposing every working part, and remedy the difficulty.



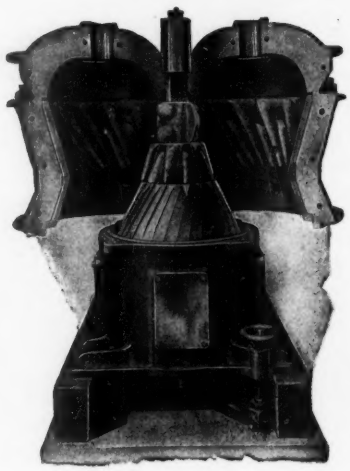
PATENTED



PATENTED



PATENTED



PATENTED

STURTEVANT MILL CO., BOSTON MASS.

HARRISON SQUARE

Rock Products

Vol. XXIII | Chicago, February 28, 1920 | No. 5

Labor Saving in Digging and Handling Silica Sand

Methods Used by Crume Brick Co., Dayton, Ohio, for Sand-Lime Brick Plant Have Wide Application

TO MINE and handle four or five hundred tons of silica sand per day at a minimum expense of labor the Crume Brick Co., Dayton, Ohio, uses a digging wagon loader, a section of portable belt conveyor and a semi-permanent belt con-

Digging wagon loader and portable belt conveyor as an excavator for silica sand pit operation, Crume Brick Co., Dayton, O.

veyor from pit to sand-lime brick factory. The device is described by W. H. Crume, president of the company, in a paper read at the recent Buffalo convention of the Sand-Lime Brick Association, as follows:

"For the digging end we have considered a number of devices, and finally decided on a wagon loader of the disc bucket type. This being a strongly built, endless bucket loader, with two 36-in. steel discs cutting under the sand and throwing the material into the path of the buckets. This loader is electrically operated and is self-propelling forward and reverse.

"This bucket loader is one of the latest machines installed by us, and we believe that it will do our work satisfactorily with some change in design, the principal one being a substitution of caterpillar type of crawler in place of traction wheels. I am glad to say that the manufacturer and his representatives are cooperating with us to make it do our work successfully. It is faulty at present in that it tends to sink into the ground when digging and also to sink into the soft sand while traveling.

"In connection with this loader we also installed a 30 ft. portable belt conveyor, driven by individual motor, to carry the sand from the loader to a 250-ft. belt conveyor.

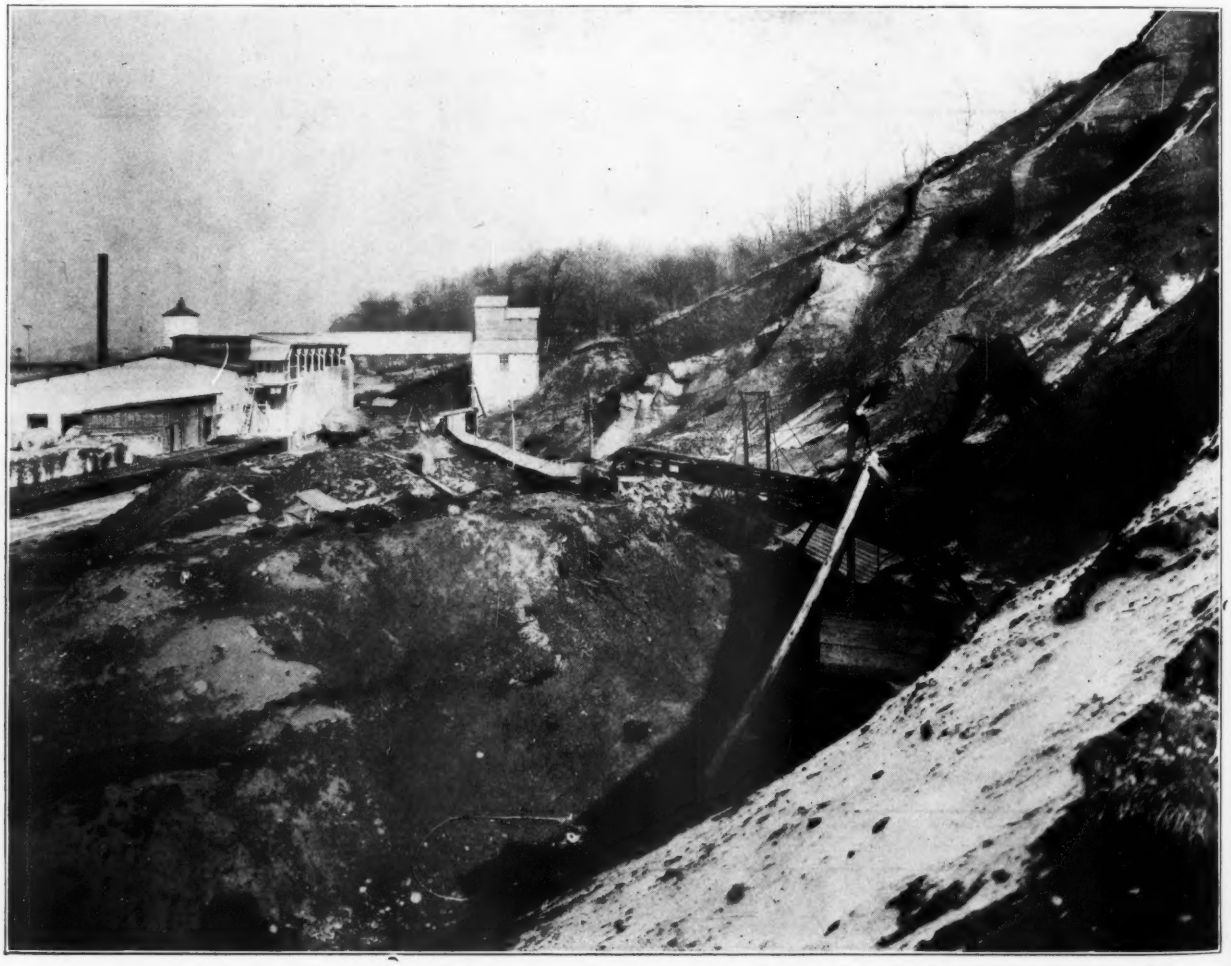
"The material is carried from the bank to the factory by a series of belt conveyors. The conveyor at the bank is 250 ft. long, built in interchangeable 12-ft. sections of cypress, with a roof of galvanized "armco" corrugated iron, and any section of roof can be removed and a hopper substituted.

"This conveyor is driven by an individual motor, and is so arranged that with the head or motor end as a pivot, the conveyor can be moved, fan shaped, to keep parallel with the face of the bank which is being worked, this being designed to keep the conveyor always within a short distance of the digging machine. At the plant end of this conveyor it discharges to a permanent conveyor about 100 ft. long, and this in turn feeds a 30-ft. bucket elevator, which discharges to a piano wire screen at the brick plant."

Loss of Agricultural Limestone in Transit

AN OHIO FARMER has called the attention of the state university agricultural authorities to the considerable loss of pulverized limestone while being transported in present-day railway equipment. He claims the loss in transit is from 2 to 10 tons per car and can see no recourse as the consignee must accept the railway company's weight at the shipping point.

The matter was referred to the National Agricultural Limestone Association at Columbus, and the following statement was obtained from E. E. Mann, traffic manager of the France Stone Co., Toledo, a member of the association: "We advise all contractors and consignees that when car of stone is received showing evidence of loss that a tally be kept of every wagon load of stone that is taken from car and with it a sworn affidavit showing the actual amount received and supporting our claim with this evidence, we have been very successful in collecting our claims of this nature."



General view showing temporary belt conveyor con nection between silica-brick plant and sand bank

Electric Locomotives for Quarry and Gravel Plant Service*

General Description, Advantages and Adaptation of the Storage Battery, Trolley, and Combination Storage-Battery and Trolley Types of Locomotives

By Kenneth Andrew and Walter Fixter

Engineers, The Baldwin Locomotive Works, Philadelphia

THE electric locomotive has attained a well-established place in our everyday commercial and industrial life; and has proven its usefulness in meeting the various requirements of our industries and systems of transportation. The types developed especially for industrial service are highly successful and achieve results which in many cases cannot well be obtained by any other form of motive power.

There are three general forms, or types, which are today well established; viz., storage battery, trolley, and the combination of both storage battery and trolley. Each type has special merit and points of advantage according to the conditions under which it is required to operate. It is not the purpose, nor is it possible, in this paper to review in full the development of all the types which are in use today, but to discuss the general characteristics of the three types mentioned above as applied to industrial purposes and to describe some examples of recent design and manufacture used mostly in industrial plants. It should be stated here that the standards mentioned in these descriptions are those of the Baldwin Locomotive Works, Philadelphia, and the Westinghouse Electric and Manufacturing Co., Pittsburgh.

Storage Battery Type

Naturally the main characteristic of the storage battery locomotive is the storage battery itself, and therefore the development of this type of locomotive is parallel throughout to that of the battery up to the point where it now stands, meeting the exacting requirements demanded for industrial service. This is evident from the fact that although the storage battery is inherently a delicate piece of apparatus, it is today produced in a form which withstands the most severe mechanical strains caused by the rough operating conditions usually encountered, and from an electrical standpoint operates efficiently both in regard to cost of power and maintenance, possessing the capacity necessary to successfully meet modern commercial requirements.

It is equally evident that to obtain the full benefit of this development of the storage battery the design of the motor and auxiliary electrical equipment must have been brought to an equally efficient plane. This has resulted in the production of high-speed motors, driving through double reduction gearing, designed for running on the minimum voltage considered practical, and having a low current rating which makes it possible for the daily cycle of operation in many cases to be performed with one charge of a battery such as can be applied to a locomotive of reasonable dimensions. In addition to this, methods of control are used which enable the motors to be accelerated with a minimum amount of current wasted through the resistance, this being effected by taking advantage of the combinations possible in connecting the field windings of motors in parallel and series to produce high torque at slow speed.

With this electrical equipment now available, the remaining important feature is the design of the locomotive in general in order that it may operate efficiently with the motive force applied. The weight of the locomotive must be kept to a minimum in order that a battery of largest possible capacity may be used and also that this capacity may be available for hauling useful load, rather than dead weight. At the same time, the design must provide for a liberal margin of mechanical strength to withstand the severe strains and hard usage characteristic of industrial service even to the point of being proof against failure under the most severe conditions of derailment or head-on collisions. There are many known instances of locomotives being subjected to tests of this kind and sustaining only slight damage. This has been largely accomplished by the general use of specially designed steel frames and bumpers as compared with those of cast iron formerly used.

Aside from these main characteristics the next important consideration is the selection of the proper storage battery locomotive for any given condition of service. In any other locomotive problem this is usually a question of the weight and tractive effort necessary to produce the desired draw-bar pull, but with the problem of the storage-battery locomotive it is almost entirely a question of selecting the proper battery to meet the cycle of operations required for the period of the average working day, which embraces the distance to be covered as well as the weight of the loads to be hauled. Owing to the fact that the battery has a limited amount of energy, the work it will perform depends in large measure upon the rate at which it is called upon to deliver this energy. The speed of storage battery locomotives is necessarily slow and the character of work performed is not such as to require high speed. Furthermore, the work is naturally intermittent and indeed must be so to enable the available sizes of batteries to successfully cover commercial requirements. From these facts it follows that it is seldom necessary to provide motor capacity in excess of battery capacity.

It is naturally desirable to have as few sizes of motors as possible, and since several batteries of different capacities may be used on a locomotive of fixed weight and motor equipment, it is possible to cover a large field with a small selection of motor sizes. The motor for a given locomotive is ordinarily large enough to utilize all the energy available in the largest battery which can be applied to such a locomotive. This may result at times in the total locomotive weight being greater than that required for adhesion, but with this method of proportioning motors to the battery there is no danger of overload as the tractive effort available is always sufficient to slip the locomotive wheels without causing any injury even when the battery is nearly discharged. These considerations make it difficult to standardize storage battery locomotives.

However, it has been found that the number of sizes required to meet the general conditions encountered in quarry service is limited. These sizes apply equally well to industrial service and are three in number; they are based upon

*From a paper presented at the October, 1919, meeting of the Philadelphia Section, Association of Iron and Steel Electrical Engineers, in the auditorium of the Engineers' Club of Philadelphia; January Bulletin of the Club.

Fig. 1. Latest design of electric storage-battery locomotive for industrial plants

Fig. 2. Heavier type of storage-battery locomotive

Fig. 3. Storage-battery locomotive with single-reduction gears

and designated by the weight of mechanical parts with motor equipment exclusive of storage battery or, as it is usually expressed, "weight of chassis." These sizes are 6,000 lbs., 8,000 lbs., and 10,000 lbs. To give an idea of the performance to be expected of these, the following table will be of interest:

Nominal Weight of Chassis, lbs.	Nominal Draw-Bar Pull, lbs.	Nominal Speed, m. p. h.	Motors Voltage	Motors Total h. p.
6000	1000	3.5	80	11
8000	2000	3.5	80	23
10000	3000	3.5	80	32

These figures are, as stated, purely nominal, being based upon the hour rating of motor equipment which has been selected for each size and found by experience to be about right. The speed is based on the average discharge voltage of the average battery which can be used with each chassis. The actual speed in any particular case will therefore depend upon the actual applied voltage and hence upon the battery used.

Storage-battery locomotives of larger type have been built but without any attempt at standardizing to the same extent. The weights run from 10 to 25 tons and the individual designs can be considered as standard for the type and weight. Owing to greater weight of mechanical parts and the space required by the cab and auxiliaries it has generally been unnecessary and often impossible to apply batteries as large in proportion to total locomotive weight as in the case of the smaller standardized sizes. For this reason it is usually necessary to use a gear ratio designed for even less speed than shown for the three smaller types, and this results in the possibility of using less motor capacity in proportion to total weight without danger of overload. The service demanded from this type of larger locomotive is steadily increasing, however, and the tendency is toward larger batteries and increased motor capacity.

The future development of the storage-battery locomotive tends toward the use of a slower speed motor suitable for operating with single reduction gearing, maintaining to a large extent the low current consumption characteristic of those now used which, with the advantage in efficiency of single reduction gearing over double reduction, should produce an over-all efficiency equal to or better than the present arrangement. The desired objects of these new tendencies in design are greater simplicity, compactness, and lower maintenance cost, due to reduction of wearing parts. The successful development of such a motor will unquestionably give added impetus to the growth of the field for storage-battery locomotives.

Fig. 1 is an example of the makers' latest design of a standard 8,000-lb. chassis (Class A-8) storage-battery locomotive. The total weight with battery used, and including cab, is six tons. It

is equipped with two V-49, 80-volt, 10-horsepower motors, single 163-A controller, and the battery consists of 80 A-10 Edison cells, rating at 375 ampere hours and 36 k.w. hours; height over cab, 6′-0″; width, 4′-8″; length, 10′-8″; wheelbase, 3′-2″; diameter of drivers, 24″; gear ratio, 13.3:1; gauge, 3′-0″; nominal draw-bar pull, 2,000 lbs. at 3½ m.p.h. The special features of the design which are common to the 6,000- and 10,000-lb. chassis are:

1. Semi-elliptic driving springs affording greatly improved riding qualities as well as being much better adapted to meet the variation in weight due to the difference in weight of the various battery equipment, that can be applied, than is the case with coil springs.

2. Journal boxes arranged to take the end thrust of the axle on the heavy box lids, thus relieving the box and wheel hub of wear, and therefore keeping the lateral play of axle within much closer limits as well as giving unlimited life to the wheel center, where steel-tired wheels are used.

3. A very simple arrangement of angle-iron gibs bolted to the frame pedestals for holding base in working position, which also provides a ready means of removing box or brass without jacking up the locomotive frame on dropping the wheels and axles. It is only necessary to relieve the box of the weight by blocking the spring and jacking the frame sufficiently for the spring staple to clear, then by removing the angle-iron gibs the box and brass can be pulled straight out.

4. The battery crate is mounted on rollers to permit rapid change of batteries in order to keep locomotive in continuous service. The steel battery crate is very substantially constructed and also arranged for being lifted by means of a crane or hoisting device, holes as shown being provided for a four-hook sling—the crate cover in three pieces is readily handled by one or two men. It is made waterproof by the joints overlapping. Circulation of air around battery is provided for by spacing between battery tray and sides of crate combined with fact that bottom of crate is of skeleton construction.

5. The motor cradle is so designed as to facilitate overhauling the countershaft with pinion and gear which can be removed without disturbing any other part of motor or gearing. This permits the use of solid intermediate gear, which is desirable.

6. The bar-steel frame used in all the makers' standard types of locomotives offers unusual facilities for inspection and overhauling of the various working parts, as well as possessing in the greatest degree the very important feature of minimum weight for necessary strength and stability.

Fig. 4. Burden-bearing storage-battery locomotive

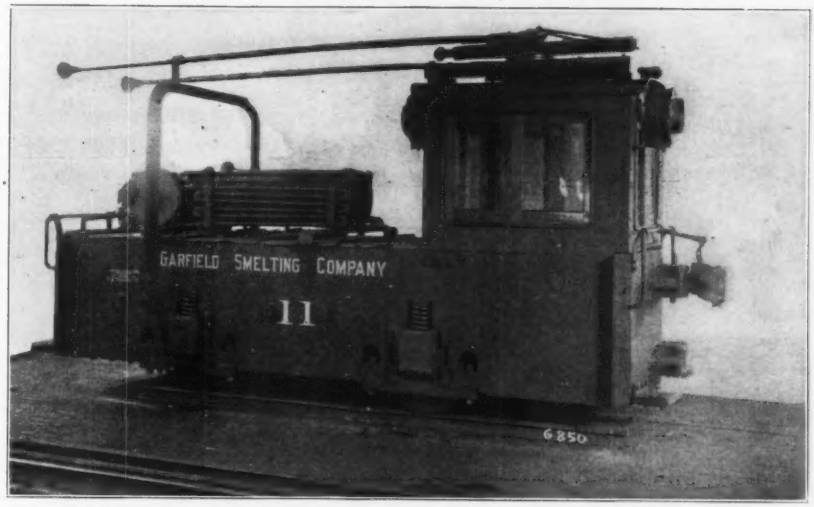


Fig. 5. Fifteen-ton trolley type of electric locomotive

Fig. 2 illustrates one of the heavier types of industrial storage-battery locomotives for 4′-8½″ gauge, total weight being 20 tons. Battery consists of 100 MVY-19 ironclad Exide cells giving 288.5 ampere hours, and 55.6 k.w. hours, charging and discharging in series, and assembled in two equal groups located under the hoods at each end of the steel cab. Equipped with two Westinghouse type V-67-P, 250-volt, 35-horsepower motors with double reduction gears, ratio 35.2:1. One type K-40-A-2 controller. Switchboard on which is mounted meters and circuit breakers. Brakes are Westinghouce straight air for service, and hand brake for emergency. Dimensions: Length between couplers, 18′-18″; width over all, 10′-0″; height over cab, 11′-6″; wheelbase, 8′-0″; journals 5x9; steel-tired wheels, 36″ diameter, with cast iron centers. Designed for hauling standard freight cars and equipped with all I. C. C. requirements. The normal draw-bar pull is 5,400 lbs. at 3.3 m.p.h. based on hour rating of motors, which is 125 amperes at 176 volts. The general design of this locomotive may be considered as standard for such service, and is followed for 15- and a 25-ton size with only minor changes.

Fig. 3: This is a somewhat crude example of a storage-battery locomotive using motors with single reduction gears. The design is not special, being simply a trolley-type haulage locomotive with storage battery added, and was used chiefly in order to make quick delivery which was essential. The total weight is 7½ tons; battery consists of 56 MVY-21 ironclad Exide cells, 315 ampere hours, and 34.6 k.w. hours, charging and discharging in series. Equipment includes two 904, 250-volt, 28-horsepower Westinghouse motors with single reduction gears, ratio 13:67, operating on half voltage and producing a draw-bar pull of 3,900 lbs. at 1.55 m.p.h.; straight rheostatic controller R-86-G. Dimensions are: Gauge, 3′-0″; length, excluding bumping blocks, 10′-8″; width over all, 5′-3½″; height over battery crate,

Fig. 6. Standard trolley type locomotive with steel cab

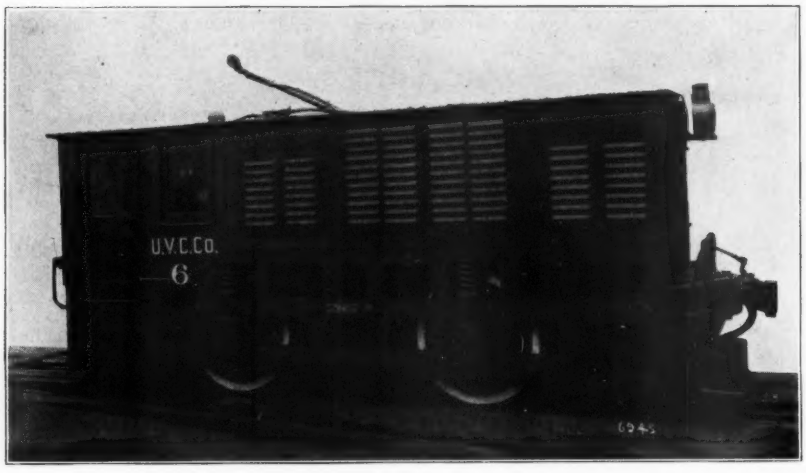


Fig. 7. Mining type of electric trolley locomotive

4'-1½"; wheelbase, 4'-4"; wheels, 24" diameter, chilled cast iron.

Another locomotive of this general type has been built having an especially designed frame, thereby reducing the weight of mechanical parts. The total weight is approximately 6 tons; battery equipment, 100 Edison A-6 cells, 225 ampere hours and 27 k.w. hours. The motors are two No. 901-B 10-horsepower Westinghouse motors specially wound for 125 volts. At the hour rating of these motors the draw-bar pull is 1140 lbs. at 4.25 miles per hour. This locomotive is giving very satisfactory results and is the forerunner of the type which may later be developed, as already mentioned, with specially designed motors possessing the characteristics required for economical operation with storage batteries.

Burden-Bearing Locomotive

The burden-bearing locomotive is a type of storage-battery locomotive which is in quite a separate class. The same considerations of battery and motor capacity already discussed cannot be applied, since naturally with full burden the adhesion is always much greater than necessary. The most important consideration with such a locomotive is the fact that frequently it is desired to haul trailer loads in addition to the burden. Under such conditions it is impossible to apply equipment which will be proof against injury if the locomotive is improperly used. The trailer load should never be in excess of what the equipment would handle if rated strictly on the basis of a haulage locomotive. Burden-bearing locomotives are not standardized in any way, each case depending upon the work to be accomplished and the design and application of equipment has to be made accordingly.

Fig. 4. This locomotive is an example of the burden-bearing type of 50-ton capacity, adaptable for trailer loads. Its equipment consists of two V-49-X motors, each rating 80 volts 102 amperes for one hour, 80 volts 60 amperes continuous; gear ratio 18.1:1.

The battery consists of 90 MVY ironclad Exide cells rating at 126 ampere hours and 22.2 k.w. hours, or 144 cells Edison G-5 rating at 125 ampere hours or 21.6 k.w. hours. As a burden-bearing locomotive with 50-ton load the speed on straight level track with the lead battery is approximately 4.2 miles per hour; and with the Edison battery approximately 4 miles per hour. Assuming that the locomotive is loaded with a 50-ton burden, the draw-bar pull, at hour rating of the motor equipment will be approximately 1,460 lbs. and the speed on a straight level track approximately 2.9 miles per hour with the lead battery, or 2.55 miles per hour with the Edison battery.

Trolley Type

This is the original and thoroughly proved type and is the more common one in use for all purposes, particularly in mining service, but owing to the disadvantage of having trolley wire or collector rails around industrial plants it has never been adopted to the extent that would be expected in view of the demand for electric locomotives for such service. Wherever the conditions permit using this type with safety, and particularly where the haul is long and loads heavy, it is the logical one to use. In many cases special forms of collector rails and other devices can be used which largely remove the danger to workmen, but where safety considerations are paramount and where fire risk is an important factor, the storage battery type is better adapted. Owing to the practically unlimited source of power available, the motor capacity is generally much greater than for storage battery types and performance is therefore almost entirely mechanical.

At operating speed the draw-bar pull is based on an adhesion factor of 20 per cent of locomotive weight with chilled cast iron wheels on clean dry rail. With steel-tired wheels this is increased to 25 per cent. For starting, an adhesion factor of 33⅓ per cent with the use of sand on the rail is permissible. The motor equipment in all cases pro-

duces tractive effort sufficient to slip the driving wheels, thus providing protection against injurious overloads. For all conditions except heavy high-speed freight service the two-motor equipment with single reduction gearing is used, having a speed of 6 to 8 m.p.h. under full load. Control is usually straight rheostatic type with drum controller, though the pneumatically operated unit switch type and magnetic type are used for the heavier locomotives.

Fig. 5 is a 15-ton straight trolley locomotive with rolled steel plate frame; gauge, 3′-0″; width ,5′-3″; height, 7′-0″; length, 13′-3″; straight air brake; steel cab over control end. Electrical equipment consists of two No. 906 250-volt 75-horsepower Westinghouse motors, with R-112-C controller, is equipped with double trolley poles to suit variable location of supply wires. Wheelbase, 5′-6″; diameter of driving wheels, 33″.

This locomotive is used around a smelting plant for switching purposes where there is no objection to use of trolley wire.

Fig. 6 shows a standard 15-ton trolley industrial locomotive with central steel cab, has air-brake equipment, sanders, and all I. C. C. requirements, specially designed collector support for third and fourth rail, metallic circuit. This is an illustration of the means resorted to in order that the collector rails may be located where there can be little risk of danger to workmen and also where there will be no interference with overhead cranes. Length, 15′-10″; height, 11′-0″; width, 8′-0″. Electrical equipment consists of two No. 101 220-volt 50-horsepower Westinghouse motors with R-109-P rheostatic controller; wheelbase, 6′-4″; diameter of driving wheels, 33″.

Fig. 7 is a 25-ton standard mining type locomotive adapted for industrial service, particularly for tunnel haulage with restricted clearance; over-all height, 7′-0″; width, 6′-9½″; length, 15′-6″; standard gauge, 4′-8½″; steel cab over control end, with hood extending over full length of frame to protect equipment and which provides location for Westinghouse HL control and air-brake apparatus. Motors are two No. 910 250-volt 100-horsepower rating. It has control connected to run in multiple with two other locomotives of the same design; wheelbase is 6′-4″; diameter of drivers, 36″.

This is an example of the heaviest four-wheeled type locomotive used for service where clearances are restricted to height. It is in effect a mine type in this respect and shows compact design without interfering with accessibility to the equipment for inspection and overhauling.

Fig. 8 illustrates a 60-ton switching locomotive with double truck of rigid bolster equalized locomotive type same as used for railroad freight and switching service; structural steel frame, MCB journals, rolled steel wheels, radial drawbars, spring draft gear, 14-EL air-brake equipment, 4′-8½″ gauge; width, 10′-0″; height, 12′-6″; length, 38′-0″; equipped with four 308-B-2 600-volt 130-horsepower Westinghouse motors with double HL control and pantagraph trolley; wheelbase rigid, 7′-4″; total, 25′-0″; diameter of drivers, 36″.

Fig. 8. Sixty-ton electric switching locomotive, standard gauge

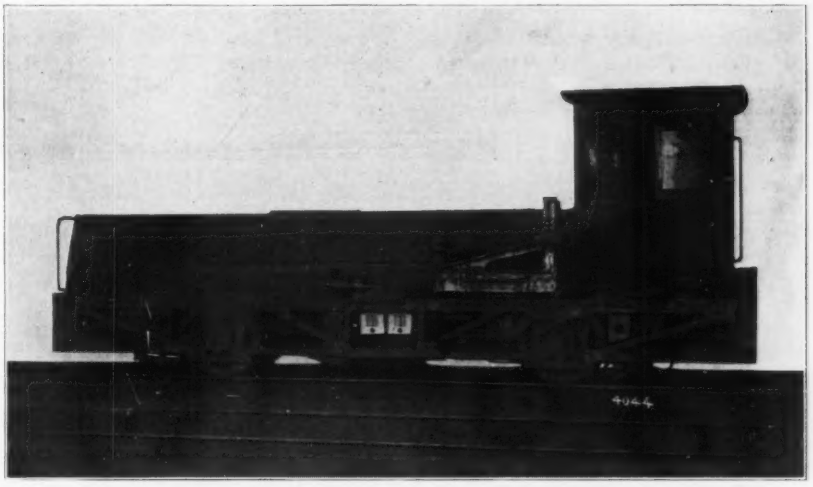


Fig. 9. Pusher type of locomotive used at Great Lakes ore docks

This locomotive was given a rating of 22,800 lbs. tractive effort at the hour rating of the motor equipment, and 13,200 lbs. tractive effort at the continuous rating of the motor equipment based on 300 volts.

Pusher Locomotive

Fig. 9 represents a 25-ton so-called "pusher" type locomotive as distinguished from those using draw bar, designed to handle freight cars at the ore docks of the Great Lakes. The car tracks run directly under the ore chutes and the locomotive track, 3′-6½″ gauge, is placed between the regular tracks and is approximately 10′-6″ from center of standard gauge track on either side. The push poles operated by air extend out on each side and can be raised to a vertical position when not in use. To move cars the pole is dropped between the end sills of two coupled cars of a train, pushing cars or retarding same as desired; is equipped with steel cable and hook attached to front end for pulling cars out of reach of push pole; third-rail collectors located in center of narrow gauge track, straight air-brake equipment; equipped with two No. 910 250-volt 100-horsepower Westinghouse motors with H-L control; height, 10′-10″; width, 5′-6½″; length, 24′-8″; wheelbase, 12′; diameter of drivers, 36″.

Notice is directed to the unusual length of wheelbase for the weight of locomotive; this is necessary in order to reduce the wheel flange pressure and hence wear, which would result in using this method of propelling cars with wheelbase of normal length.

Advantages of the Pusher Method of Handling Cars

One of the chief advantages of this method of handling cars is the fact that the locomotive can control cars on two tracks at one time, spotting cars on one track while the cars are being loaded on the other. In addition to this, the motorman is in a position to see when cars must be moved, or to receive signals direct from the man operating ore dump, as compared with necessity of relaying these signals in the manner usually required with a steam locomotive coupled to the end of train of cars; this not only greatly reduces the time required for each shift, but also reduces the possibility of accidents, as well as insuring more accurate placing of cars.

Combination Trolley and Storage Battery Type

This type naturally possesses many of the advantages of the storage battery and trolley types, but is adapted for use only where conditions warrant. The added flexibility to be gained by the storage battery is important in covering a large area with a minimum expenditure for overhead construction, as well as offering a solution for combined indoor work where trolley wire would be prohibited with outdoor work where loads and length of haul might be beyond the capacity of a reasonable size of battery, without frequent recharging or changing of batteries. The battery is charged while locomotive is operating on the trolley and can thus be kept in practically fully charged condition without consuming additional time. The chief disadvantage is the difficulty of applying a battery of necessary capacity without exceeding the permissible weight for the motor equipment, but where the period for battery operation is short compared with that for trolley operation the battery can safely be much smaller than would be the case for straight battery operation. This shows the necessity for carefully checking conditions and the cycle of operation to be performed before considering the use of the combination locomotive.

Fig. 10 represents a particularly good example of the way in which a combination locomotive can effect great saving over any other type, in addition to performing two distinct kinds of service. This locomotive is one of four recently completed and which were designed with special features to meet rather exacting requirements in connection with loading coke cars. The capacity of the locomotive is 33 tons, of 4'-8½" gauge, for operation on third rail by means of remote control, and in yard service by storage battery; it can be operated independently or in tandem. One operating feature is to handle a train of cars at a tipple by remote control through third rail, so that tipple operator can spot the cars to effect even loading and trim with minimum expenditure of time and power. This facility has insured an average gain of three to four tons to load of car.

Fig. 10. Combination third-rail and storage-battery locomotive

While the tipple attendant is operating the locomotive and train, the crew is using another locomotive on storage battery for yard service; thus two crews virtually man four locomotives working under evenly distributed conditions of service, displacing four steam locomotives with necessary full crews which formerly did this work but not so effectively. The economy of the electrical introduction is thus apparent. The equipment consists of two Westinghouse No. 908-C 250-volt 75-horsepower motors with HL control, automatic air brakes with two D-4 compressors. Under remote control air brakes are interlocked so that brakes are applied when power is cut off and released when power is again applied. The battery for yard service consists of 108-MVY-25 Exide cells of the ironclad type with giant jars rating at 378 ampere hours and 80 k.w. hours, charging and discharging in series. The battery floats on an auxiliary third-rail line and can be charged while tipple attendant is spotting cars. Height is 13'-4½"; width, 10'-0"; length, 22'-8½"; wheelbase, 10'; diameter of drivers, 33". Gear ratio, 16:72 first reduction x 29:74 second reduction.

These engines were designed with special combination features and with double reduction gearing to meet conditions requiring at times especially slow speed. Principal operation is from third rail and battery operation is only incidental and at comparative light loads. Draw-bar pull at hour rating of motor equipment, 12,000 lbs. at a speed of approximately 3.9 miles per hour, based on 250 volts; or approximately 3 miles per hour on the battery. The special low speed mentioned as being necessary when operating from the third rail is attained by arranging the remote control connection to correspond with the first notch of the controller.

Conclusion

The field of the industrial electric locomotive in special lines of service is constantly enlarging and its future development and adoption will doubtless prove a very important factor in the operation of the varied industries of our country. The rapid and efficient transportation of material in all lines of industry is becoming more important every year as being one means of improving the output of labor and reducing cost of production by using such efficient mechanical methods whenever they can be installed. It is reasonable to expect that further developments will be made along lines already established and ways found of making wider the application of electric locomotives to meet conditions where solving of transportation problems along improved lines have not as yet been undertaken.

Industrial Democracy and Colored Labor

A SOUTHERN QUARRY and mining company has no difficulty in operating under a plan of industrial democracy. This company has a senate of superintendents and heads of departments and two houses of representatives chosen from among the employees. The white employees have their house and the colored employees theirs.

The company splits 50-50 with the employees for the savings made over and above certain fixed figures and scale which were established at the beginning. This basis is changed from time to time as the costs of material and labor vary.

Increasing the Outputs of Existing Quarry Plants*

Experience and Advice of One of the Largest Quarry Operators in Chicago District

By Col. O. P. Chamberlain
Vice-President and General Manager, Dolese & Shepard Co., Chicago, Ill.

WHEN YOUR PRESIDENT, G. P. Coleman (American Road Builders' Association) requested me, last December, to prepare a paper on increasing the output of existing plants in the production of road-building materials, the labor situation was less troublesome than it appears to be in its present state of development. Were there plenty of laborers who were willing to work, doing a reasonable day's work for a fair day's pay, the problem of increasing the outputs of existing gravel and stone plants to which the writer will confine himself in this paper, would be comparatively simple.

We are undergoing the readjustment following the world war. We are attempting to readjust our business to meet the changed conditions that confront us compared to those of the summer of 1917. We are attempting to resume the great program for better highways, which had been years in preparation and only fairly commenced in performance, when the war interrupted, and for three seasons practically stopped, the carrying out of our projects.

Labor seems to be war-weary and inefficient. The inflated wage scale and high prices of the war period seem to be augmented since the close of the war, and in resuming our pre-war program we are confronted with conditions new to this generation: unrest, inefficiency and unreasonable wage demands on the part of labor; perhaps undue pressure and impatience on the part of legislatures and other governing bodies in attempting to make up for the three non-productive seasons in highway construction for which the war was responsible.

Substitution of Machinery for Hand Labor

In confronting our problem as producers of crushed stone, sand and gravel, we realize that our task is both difficult and immediate. It would seem that the first general principle to be adopted is the substitution of machinery for manual labor, wherever possible. Years ago laborers and mechanics inveighed against the use of machinery. The writer distinctly remembers, in his young manhood, when working on the farm, hearing the farm hands inveigh against the introduction of harvesting machinery, their grievance being that "machinery was taking bread out of the working men's mouths." These men, or their offspring, are probably engaged in watching the wheels of some machine or other go round with nothing harder to do than to stop the wheels turning or to report to a superior any irregularities in the working of the machine; and for that service they are receiving a wage undreamed of by their fathers, and living on a scale, that to their ancestors would have seemed the height of luxury. Today the working man can, if he desires, participate in practically all wholesome amusements and have all the educational advantages possessed by his employer, living the comfortable, peaceful, honorable life of a citizen of this great republic.

Col. O. P. Chamberlain

The writer will briefly discuss the various processes of quarry operation, giving what he believes to be the most efficient methods of handling the various classes of work in the preparation of crushed rock. It will be borne in mind that much of this discussion will apply equally well to the handling of sand and gravel pits.

Stripping or Removing the Overburden

The oldest method of removing the overburden was that of ploughing up the top soil and subsoil, shoveling it into wagons or carts and hauling it far enough from the theatre of operations so that it would not be necessary to again move it. This was followed by the use of slip scrapers and wheelers and this again by the steam shovel and locomotive crane, small dump cars and a short line railroad with a dinky locomotive, removing the strippings from the quarry or gravel pit site to a dump. At times the expense could be materially cut by furnishing filling for some railroad embankment or manufacturing site.

However, the machine that is most useful, most economical and most adaptable for stripping where the overburden runs from 2 to 10 feet in depth is the dragline bucket excavator, capable of turning through an entire circle. It is faster than the steam shovel and, being built with booms varying from 60 to 125 ft. in length, the larger sizes particularly do not have to move very often, and can be successfully operated with an engineer, a fireman and four pit-men.

In many quarries and pits it is possible to remove the overburden for the new workings and deposit it in the abandoned workings of the quarry or gravel pit in a single operation of the drag-line bucket. The ability of the revolving drag-line to turn through the entire circumference of a circle, and in the hands of a skillful operator to dump "on the run," stopping only to dig, makes it the fastest and most economical stripper thus far produced. A product of the present generation, now improved so that it digs as efficiently as a steam shovel with the advantages above described, the drag-line is, in the opinion of the writer, the stripping machine *par excellence*.

Stripping, when practicable, should be done in the winter and early spring, before the busy operating season opens,

*Paper prepared for and read at the Annual Convention of the American Road Builders' Association, February 12, 1920, at Louisville, Ky.

sufficient for the season's work; then the engineer, firemen and pitmen can be transferred to a steam shovel when the operating season opens.

Drilling and Blasting

The writer knows of no more economical method of drilling for blasting than the use of the well drill. In the plant operated by him near Chicago, 5-in. holes are drilled for a 40-ft. face of Niagara limestone, at a labor cost of ten cents per foot of depth. Here, too, in order to keep the organization together and employ labor to the best advantage, the drilling can be done to a great extent between seasons, following the stripping. When the busy season is at its height the drillers can be dispensed with and employed in other duties in the quarry. The writer has this winter looked with feelings akin to envy on a neighboring quarry which has sufficient rock stripped for a season's operation and a large portion of the drilling ready for the dynamite.

In discussing blasting, the writer feels that he is infringing on the prerogative of Tom, Joe or Jerry—the "powder boss." Was there ever one of these individuals who did not try to impress the superintendent with the idea that there was something mysterious and secret about his process that he would divulge to no one. As a matter of fact, the "powder boss" is frequently wasteful of dynamite, and he is a stiff-necked and almost unteachable individual.

The writer, some ten years ago, experimented with sealing the large drill holes above the dynamite charge with a mixture of stucco (quick-setting cement containing plaster of Paris) and screenings, instead of tamping with screenings or sand only. So far as he knows, the process is original with him. Try it on a few holes and see if you cannot cut down your dynamite charge per hole 25 per cent and shape up your rock just as well as you did formerly. It won't cost much to try it and it may save you some money. Don't try to convert the "blasting boss," just stand over him and force him to make the experiment.

Many acrimonious discussions have arisen as to whether it is better practice to drill two or more lines of holes back from the face for a single large blast than to blast out a single line of drill holes for a new face. The writer realizes that he is in a minority in advocating the latter method. Theoretically, he fails to see what is gained by setting one blast against the other, which is done when more than a single line of holes are exploded at once, unless the rock is so hard as to require this treatment to break it fine enough to load. In the Niagara limestone, where most of his work has been done, the writer has tried both methods, and has convinced himself that making a blast with more than a single row of holes, which in his particular work, with a 40-ft. face and 5-in. diameter holes, he drills 10 ft. apart and 10 to 12 ft. back from the face, is a waste of dynamite and a squandering of money.

Loading—Selection of Shovel

Loading in small plants and, up to about 15 years ago, in all crushed rock plants, is done by hand.

In England and on the Continent of Europe hand-loading is the accepted method.

In this country the greatest increase in output, the greatest economy in the employment of labor and the greatest decrease in the cost of production, can be secured by substituting loading by steam shovel for loading by manual labor, which involves somewhat extensive alterations in plant and equipment, which will be discussed later. Some idea of the saving in the substitution of the steam shovel for hand labor in loading can be gained from the following data:

A steam shovel operating at a cost of $55 per day of 10 hours and producing but 1,000 tons per day, loads at a quarry cost of 7.8 cents per ton, against 20 cents per ton for hand loading. These figures include a depreciation and maintenance charge on the shovel of $7,000 per year, and are conservative as, in the writer's own operation, the steam shovel performances, averaged over long periods, are 1,780 tons per day of 10 hours. Such operation means a loading cost of but 4.4 cents per ton of stone loaded. Using the conservative figures of a saving of 7.8 cents per ton in a one-shovel plant, which should produce 400,000 tons per year, the annual saving in the substitution of steam-shovel loading for hand loading is $58,800.

In the installation of a steam-shovel plant the size of the shovel should be carefully considered. In general it is well to let the initial crusher rather than the steam shovel be the limiting factor in the capacity of the plant. While you may handle present production with a 60 or 70-ton shovel, you can handle it much more comfortably with a 110-ton shovel, and you are in a position to increase your output materially without a new installation. This installation of a small, light shovel is a common mistake made in converting hand loading plants into shovel-loading plants. The error is invariably corrected after a few years of steam-shovel operation. It is well, however, to remember that while a heavy shovel means a large initial cost, this shovel, working considerably below its maximum capacity, is not apt to be delayed by vexatious breakdowns and its maintenance and depreciation is much less than that of a light shovel that is continuously crowded to its maximum.

Motive Power and Quarry Cars

The substitution of steam-shovel loading for hand loading must generally include the installation of new quarry cars and motive power. Most of the hand-loading plants used men or mules or horses as the motive power for bringing the loaded cars to the foot of an incline, and the cars were handled up a steep incline to the initial crusher by a steam or electric hoist. In a shovel-loading plant a small locomotive generally replaces the man or mule motive power in the level quarry bottom.

It is difficult to load stone with a steam shovel into cars of less than 6 cu. yd. (7½ tons) capacity and a car capable of handling 12 cu. yds. (15 tons) is preferable to the smaller size. In designing your car, remember that you are building for the roughest, heaviest duty known. It takes a strongly built car to successfully withstand the impact of 4 tons of rock dropped 3 feet to the car floor. Of course, the steam shovel engineer and craneman is not supposed to drop the rock three or even a single foot, but sometimes they do so, with disastrous effect on light equipment.

In the writer's own experience he has practically rebuilt the 15-ton cars. They had originally axles standard for a 30-ton railroad car. Axles were broken almost daily. Now, with the standard axle for a 50-ton car they are giving good service. The original steel underframes have been replaced with heavier structural work, the pedestal castings carrying the journal boxes have been re-designed and built of cast steel instead of gray iron, the car floors which were originally 3-in. oak plank are now of 6-in. oak timbers carpeted with steel T-irons with the stems of the T's let in between the oak floor timbers.

This experience in learning how to build a really serviceable quarry car has been expensive, but it has also been conclusive. The writer congratulates himself that he was not responsible for the original design of these cars with the full consciousness that he would undoubtedly have made the same errors that were perpetrated by the designer. Steam-shovel loading was an innovation when these cars were designed. Surely a mechanical engineer should hardly be censured for assuming that a 3-in. oak floor would be adequate for a small car and that a master car builder's standard axle for a 30-ton railroad car would be of more than ample strength for a 15-ton quarry car. He simply failed to appreciate the perversely ingenious, diabolical destructiveness of the careless craneman.

The Crushing Plant

All that has been said in regard to the changing of a hand-loading plant to a steam-shovel loading plant assumes a modification of the crushing plant. Most of the hand-loading plants with which the writer has been acquainted contained as an initial crusher a No. 7½ gyratory crusher. Fifteen years ago a No. 9 plant was a monster in the Chicago Niagara limestone district. Today many of the No. 8 and 9 plants have been converted over into steam-shovel loading plants by interposing a No. 12 gyratory or some other type of giant crusher between the quarry and the former initial crusher and adding one or more auxiliary re-crushing machines in addition to augmenting the screen capacity of the plants to take care of the increased production.

A good No. 9 plant could have been built between 1910 and 1916 at a cost of from $90,000 to $150,000. Such a plant can today be converted into a steam-shovel loading plant by the addition of a No. 12 gyratory crusher and the necessary re-crushing and screening accessories, together with a heavy-duty steam shovel and new heavy quarry cars, at a cost of from $90,000 to $120,000. While the cost of such a plant transformation today is at least a hundred per cent advance on that of 1916, the practical assurance of adequate demand for one's product warrants the transformation of these small plants, even at present high prices for equipment and installation.

Remember that this country with its prospective road building is crying for the increased tonnage.

The modification of existing plants herein discussed means the changing of a 200,000-ton per year plant into a 400,000 ton per year plant. It means doubling the production with less than 50 per cent of the present staff of employees, which in itself in these days of labor scarcity is no inconsiderable item.

It means, if one cares to put it that way, the return of the entire investment for the rehabilitation of the plant and equipment within the next two years. It means a handsome return to investors and fine profits to the operators.

It has occurred to the writer that he may be accused of departing somewhat from his text viz: "How Shall We Increase the Output of Existing Plants." His justification is that these hand-loading plants will not for many years be "existing" plants, unless the changes herein suggested are made promptly. To paraphrase a recent popular song known as "Mr. Zip, Zip, Zip"; "If the Steam Shovels Don't Get You the Sheriff Must." With the present scarcity of, and high prices for labor, the hand-loading plant cannot long exist in close competition with the steam-shovel loading plant. The time is ripe for these small plants to reorganize for larger production and the improvement and rebuilding of American highways.

Other Suggestions for Increasing Outputs

As has been before stated, much of what has been given in this discussion is equally applicable to sand and gravel plants as well as stone-crushing plants. The general principle of substituting machinery for hand labor wherever possible applies to all road materials, cement, asphalt, and tar products. Cement is today essentially a machine-made product. The elimination of manual labor in the preparation of asphalt and tar products has progressed rapidly during the past decade.

It has been suggested that the production of crushed rock and gravel may be increased in existing plants by working out some definite plan of co-operation between employees and the management of various plants.

This is hardly a new proposition in manufacturing businesses. Various bonus and so-called profit-sharing systems have been tried from time to time in many industries with varying degrees of success. It has recently been brought to the attention of the writer that one of the gravel companies in the Chicago district has operated for one season under a bonus system quite successfully. A basic cost per ton is set in accordance with past experience. Any saving below this cost is divided *pro rata* to the fixed wages of the employees among all of them. If there is no saving, there is no bonus and the management stands any increase above the basic cost.

There are serious objections to this system. One is that in a one steam-shovel plant whether the output is increased and the cost consequently decreased depends on the work of not more than ten men out of a total of about forty who should be employed at such a plant. No matter how diligent and faithful the other 30 men may be, the output of the plant depends on the superintendent, the steam-shovel crew and a few of the attendants at the initial crusher. It seems to the writer that a bonus to these ten employees *only* would be more likely to produce satisfactory results than a division among the larger number whose duties are such that their diligence or lack of diligence can in no wise affect the output of the plant.

Again, if a substantial bonus earned one month and no bonus the succeeding month, labor, in its present mental attitude, will probably demand an addition to its wages equal to the bonus.

Double Shifts

An effective method of increasing the output of existing plants is the working double shifts through the busy season during the months of July, August, September and October. By timing these two successive shifts so that the first starts work at or shortly before sunrise and the second follows 8½ hours after the first starts, one-half hour being allowed for luncheon for each crew, the working of two 8-hour shifts is perfectly feasible, and has been successfully accomplished.

This necessitates an increase in the normal force of not over 60 per cent as shop men and repair men may be worked 10 or 11 hours, their shift starting 3 or 4 hours after the early operating shift and continuing through the early hours of the second operating shift.

Open Shop

The writer has always operated under the open-shop system. Some employees are union men, others are not. From a long experience in the handling of both union and unorganized labor, the writer is firmly convinced that production would be increased and labor troubles minimized under unions, controlled and officered by honest officials. Since the present shortage of labor, our troubles have been not with organized labor, but with the "cliques" of so-called unorganized laborers whose demands for more money and still more money are vociferous and continuous. In the writer's experience the labor organizations with which he has dealt have lived up to their agreements, have tended to stabilize the industry and improve working conditions and increase the output. In fairness to organized labor it is a satisfaction to be able to pay this tribute.

Agricultural Marlime

THE CLAREMONT MARL PRODUCTS CO., Inc., Claremont, Va., operates a plant to manufacture what is commercially known as "Marlime." Marl is the common name for non-crystalline or "baby" limestone, the company states, and it contains from 85 to 95 per cent of carbonate of lime which is softer and more soluble than most limestones.

The analysis of this material is as follows:

Calcium Carbonate	90.94%
Phosphorus	0.31%
Magnesium	1.36%
Potash	0.37%
Moisture	0.62%

The holdings of this company comprise over 400 acres containing several million tons of marl. These are original deposits, in their natural state, a loosely cemented mass of shells and other marine life, composed mainly of calcium carbonate. They were left by the recession of some inland lakes or water many thousand years ago. The deposit is from 20 to 25 ft. in depth. Marl weighs about 100 lbs. per cu. ft.

The plant is equipped with the latest type of machinery and is capable of drying and pulverizing over 200 tons per day. Material is shipped both in the bulk and in sacks.

National Crushed-Stone Association

P. C. Hodges Draws a Man's Sized Job

CHAIRMAN OF THE TRAFFIC COMMITTEE with power to appoint his own associates on the committee was the job handed P. C. Hodges, of the Marble Cliff Quarries Co., Columbus, Ohio, at the recent convention of the National Crushed Stone Association at Louisville, Ky. Every shipper of mineral aggregate knows or ought to know that this is a real job.

Mr. Hodges, it was at once recognized, is peculiarly fitted for it. For twenty years he served with the traffic departments of railway companies. The last 18 years of this experience was with the Norfolk & Western R. R., whose employ he left in May, 1918, to join in the management of the Marble Cliff Quarries Co.

For seven years Mr. Hodges was chief clerk to the general freight agent of the railway company at Columbus. During that period he had charge of the issuance of all tariffs and percentage sheets published by the Columbus office, necessitating of course a thorough knowledge of rate making and traffic practice and conditions in general. From 1913 to 1918 he was commercial agent of the N. & W. R. R. at Toledo, Ohio, in charge of all territory in northern Ohio, northern Indiana and the State of Michigan.

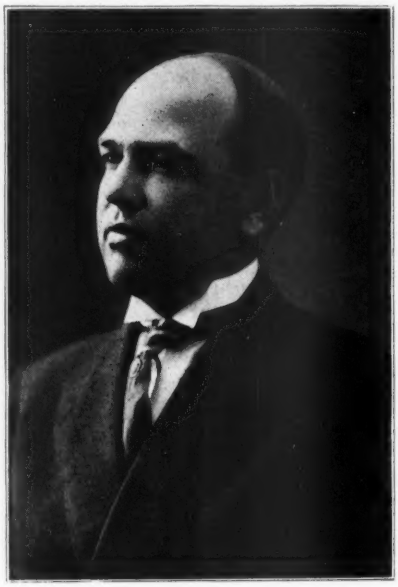
Mr. Hodges is also serving with the committee on transportation of the National Brick Manufacturers' Association, which has already had considerable experience in collecting and compiling data to be used in presenting its case.

Mr. Hodges writes: "To my mind the rate problem is of secondary importance to that of service. I believe we will see this spring the greatest shortage of open-top equipment we have ever experienced. It is my idea to gather such data as will enlighten our own industry as to the important place it should hold in the eyes of rate-regulating bodies and transportation officials. I believe if the total volume of the stone, sand, gravel and slag business can be shown in *transportation units*, as to tonnage and revenue, that we will be able to attract some attention with the powers that be; and through this showing get due consideration in the distribution of the equipment that will be available. Heretofore we have had only the leavings and nothing else. In other words, I do not believe the industry knows its own strength, and not knowing it, cannot make the proper appeal when danger confronts it from the standpoint of transportation facilities."

Convention "Hangovers"

W. SCOTT EAMES furnished one of the most entertaining features of the program in the shape of moving pictures of the plant of the New Haven Trap Rock Co., Branford, Conn. These pictures showed the drilling and blasting of one of the largest shots ever made by the company.

One of the most interesting features of his plant is the transportation of the finished product to the main line of the



P. C. Hodges

New York, New Haven & Hartford R. R., and to a scow-loading wharf on the waterfront on Long Island Sound. The quarry company operates a 5-mile steam railroad as part of its plant.

ALLEN PATTERSON, of Lima, O., a quarry man of 35 years' experience in the crushed-stone game, gave a word of warning in regard to *daily* cost records. He said they were the most misleading things in the world and were absolutely valueless as a basis for setting prices. He thought the chief good that could come from an exchange of operating costs was the emphasis it would place on the necessity of including all the various items of cost. Mr. Patterson's experience in the crushed-stone game began with a portable No. 1 Gates crusher. He was one of the founders of the first association of crushed-stone producers, the Ohio Stone Club, the forerunner of the present Ohio Macadam Association, of which he is—and always has been—one of the leading lights.

DWIGHT E. WOODBRIDGE, of the Mesaba Iron Co., Duluth, Minn., is one of the most recent acquisitions of the crushed-stone industry. Mr. Woodbridge's company will make crushed stone as a by-product of concentrating iron ores. This operation is described in another column of this issue. W. Scott Eames, of the New Haven Trap Rock Co., is associated with Mr. Woodbridge in the development of this new crushed stone business.

ALEXANDER HARRIS, of the Holston Quarry Co., Knoxville, Tenn., proved himself a real orator and a most capable representative of the southern quarry industry. His analysis of the freight-rate, car-shortage problem met with spontaneous applause and approbation.

E. EIKEL, of the Dittlinger Lime Co., New Braunfels, Tex., was one of those who came farthest to the convention. He made some interesting and valuable contributions to the discussion on freight rates.

ROBIN BOYLE, of the Provincial Crushed Stone Co., Ltd., Toronto, Canada, made a very effective plea for the next convention, and if the American Road Builders' Association can be persuaded, Toronto will be the next convention city.

L. H. HAWBLITZ, of the France Stone Co., ably seconded Mr. Boyle's suggestion of Toronto, by reading a telegram (?) of invitation, signed "Canadian Club, by Johnny Walker."

SECRETARY SANDLES exchanged fraternal greetings by telegram with Secretary Sutton of the National Association of Sand and Gravel Producers in session at Chicago.

COL. O. P. CHAMBERLAIN, vice-president and general manager of the Dolese & Shepard Co., Chicago, got in the wrong stall and delivered a paper at Road Congress that should have been read to the stone men—but they can read it on another page of this issue!

COL. R. B. TYLER, as Secretary Sandles said, can be elected to a third term for any office he wants.

Raising the Dignity of Our Quarry Products

IN ONE OF THE EARLY reports of the Ohio Geological Survey, on the limestone and cement-making materials of the state, attention was called to the fact that Ohio was lacking in those minerals which had brought great wealth and fame to many states farther west, but that in its great limestone deposits Ohio, nevertheless, had a mineral wealth far greater in the aggregate and of much greater usefulness to humanity than the gold and silver of California and Nevada.

The same is true of Indiana, Illinois and Iowa, which, like Ohio, have thousands of acres of limestone quarry land and plenty of coal to work them into useful and valuable commodities.

The fact that these great limestone deposits are a source of wealth and of great value to the state, even as gold is to California and silver is to Nevada, is seldom recognized. Therefore, such exhibits as those of the State of Illinois at the Mining Congress in St. Louis last November are to be highly commended; and it is hoped that quarrymen in other states will profit by the example and see to it that their commodities receive similar public recognition.

The exhibit is described for ROCK PRODUCTS by James Taylor, investigator of Illinois Department of Mines and Minerals, as follows:

"The mineral resources and quarry industry of the State of Illinois were represented in an attractive manner. In response to a general invitation sent out by the Director of the Department of Mines and Minerals, J. C. Thompson, to mineral producers in the state, a considerable amount of material was courteously sent by many quarrymen and the exhibits were made even more representative through the efforts of Dr. A. R. Crook, chief of the State Museum; Richard Neeson, state mine inspector, and James Taylor, special mining investigator, who visited many quarries and secured much material.

"Maps showing the location of sand and gravel pits and quarries, and charts setting forth mineral production in the state were a part of the exhibit.

"The State Museum exhibited fine specimens of all the different kinds of minerals known to have been found in the state. The 50 different varieties were illustrated by about 200 specimens.

"Many companies engaged in quarrying and preparing limestone for use as macadam stone, as concrete aggregate, and for cement manufacture, as whitewash, as fertilizer and as building stone sent comprehensive, attractive exhibits.

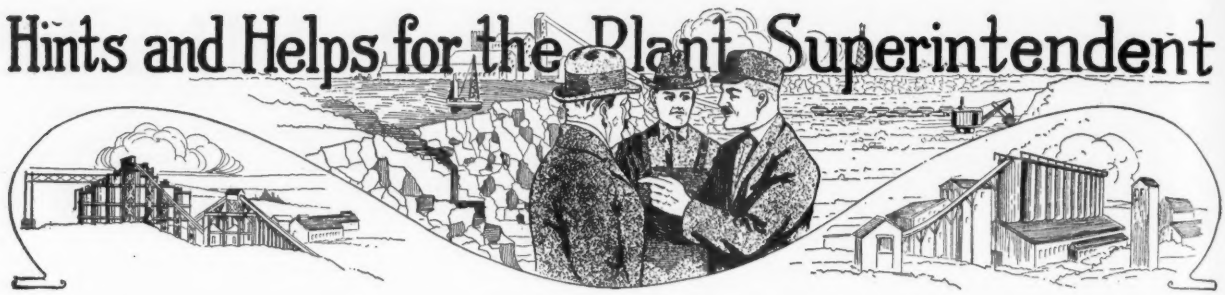
"Samples of sand and gravel, useful for concrete work, road material, molding sand, glazing sand, abrasives, etc., were shown.

"Altogether the Illinois exhibit was greatly enjoyed by the public if one may judge by the large number of visitors and by their many expressions of appreciation.

State of Illinois' exhibit at the American Mining Congress, St. Louis

Many samples of limestone and sand and gravel shown as proof of the State's wealth in useful minerals

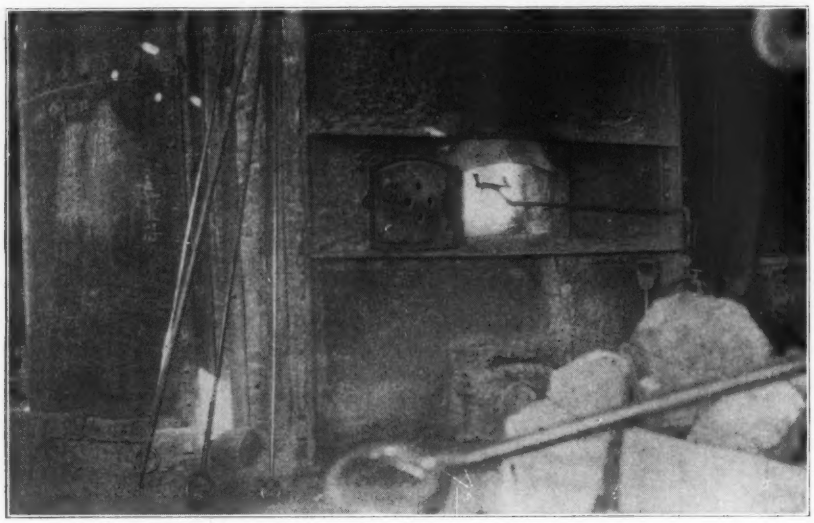
Hints and Helps for the Plant Superintendent



Water Spray for Lime Kiln Furnace

A COAL-FIRED FURNACE of a shaft lime-kiln often gives too hot a fire for best results. The tempering of this intense coal fire is generally given as one of the reasons for using steam jets both above and below the furnace grates.

The tempering effect of the water vapor or the steam can be obtained by a fine spray of water, played directly on the hot coal bed of the fire, according to the experience of the F. W. Wait Lime Co., Glens Falls, N. Y. One of this company's kilns equipped with a water spray is shown in the accompanying illustration.



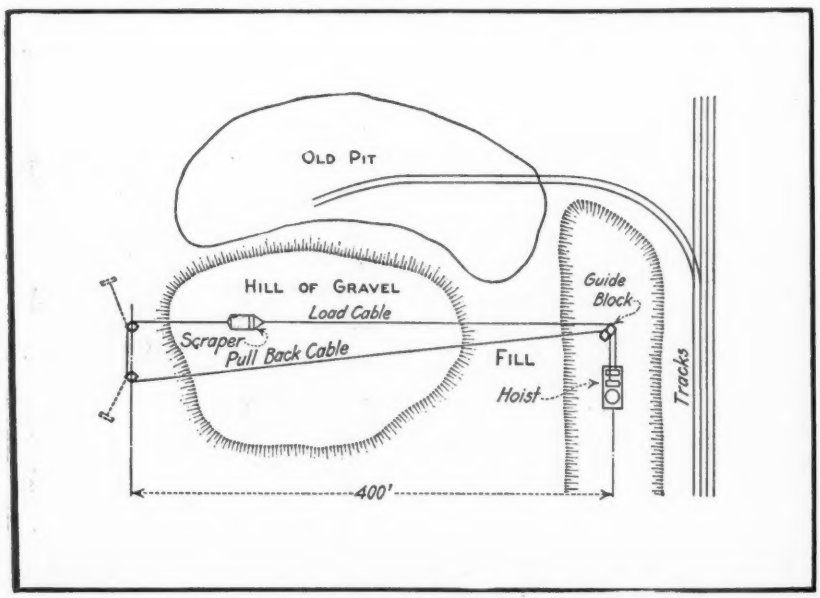
Water spray to temper flame of coal-fired lime kiln

This spray is not used continuously, but only when the fire becomes too intense, in the opinion of the fireman.

There is another reason for using either steam or water in this manner. It converts the furnace partly into a water-gas producer, by disassociating the water into combustible gases (carburetted hydrogen) exactly as is done in the ordinary process of making illuminating gas. This gas of course ignites at once, but burns with a longer flame and consequently farther up in the kiln than the ordinary coal flame. Moreover, on burning water vapor is again formed, and the presence of this aids in driving off the CO_2 of the stone.

Stripping Overburden

A BOTTOMLESS BUCKET is used in removing the overburden from a hill to get at the sand and gravel underneath by the Diamond Sand & Gravel Co., at Bedford, Ohio. The top of the hill is being scraped off and deposited in a ravine at one end of the hill. The accompanying sketch shows the layout of the installation.



Drag-line stripping of sand and gravel deposit

The scraper is operated by a 90-h. p. electric hoist, which is set up on high ground across the ravine. The hoist is arranged so that the rear drum operating the "pull-back" cable has a speed three times as great as the front drum. The machine requires one operator and a rigger stationed at the guide blocks to make the necessary shifts in the line of operation.

The top soil of the hill is largely clay and runs from nothing to 6 ft. in depth. Hard "shoulders" of clay, when encountered, are removed by "sawing" the scraper back and forth over the obstruction. A day's output will fluctuate between 200 and 300 cu. yd., depending on the nature of the material.—From "Successful Methods" for February.

Revolving Car Dumper Hoist Operated

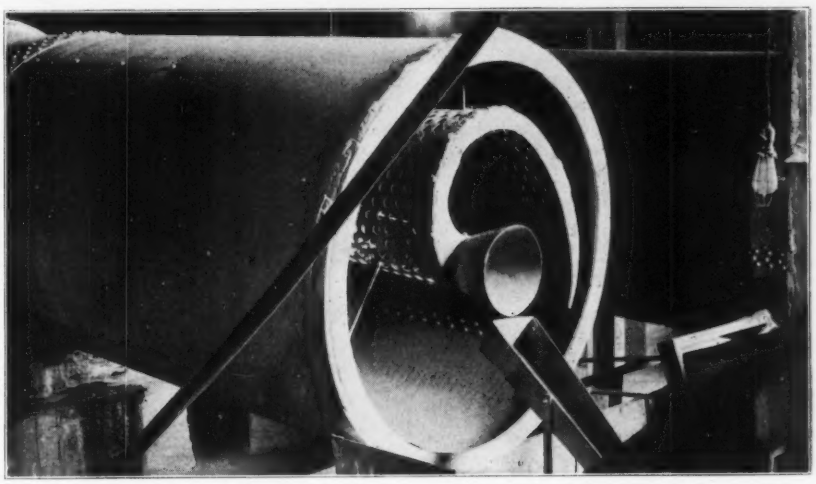
A REVOLVING car dumper as here illustrated is in use at the shale crushing plant of the Monarch Cement Co. plant at Humboldt, Kans. The view shows the car just after it has been dumped and is still in the dumping position.

The dumper is so designed that the cars will run in close and leave but little space above. Each end ring of the tipple rests on two roller bearings so that when the clutch of an electric hoisting engine is thrown in, the car and dumper will rotate quickly 180 degrees. While rotating the car is held in position by the top of the car dumper and by a rail section which is placed above the car wheels.

Revolving car dumper at the plant of the Monarch Cement Co.

Oversize Screen for Cement Clinker Cooler

CLINKER over 5/8-in. is removed from the rest as it leaves the cooler at the Great Western Portland Cement plant, Mildred, Kans., by a screen mounted in the end of the cooler. The accompanying view illustrates the nature of the screen and how it is fastened. The oversize is crushed in a small Williams mill and then unites with the rest of the material.



Spiral screen for removing oversize of cement clinker

Portable Quarry Pump

AT THE SPEEDS, IND., quarry of the Louisville Cement Co., an unusual device is used for drainage. A centrifugal pump and electric motor are mounted on a flat car and moved to whatever part of the quarry needs its use most.

The accompanying view shows this portable pumping station at work on one side of the quarry. The trestle in the foreground carries the power wires and the pump outlet pipeline.

The pump outlet is shown rising vertically from the roof of the car.

Of course the same device could be used where electric power was not available by using a gasoline-engine unit.

The car is not self-propelling, but can of course be moved to any part of the quarry by a locomotive.

Portable pumping plant for quarry drainage

Sandstone Blasting Experience

T. M. HANSBARGER, superintendent of the Green River Quarry, Sebree, Ky., sends the following experience in shooting sandstone for concrete aggregate for the construction of Lock and Dam No. 48, Ohio River: "I have drilled six holes in a ledge 100 ft. long, 28-ft. depth of face, 15 ft. back from face. Used 12 kegs of black powder, 90 sticks of dynamite, 19 blasting caps. Results have been very successful. Labor is scarce."

Imported Sand, Gravel and Crushed Stone in New York

Severe Weather Conditions Make Material Brought in as Ballast Only Available Supply for a Time

BUILDING CONTRACTORS have emerged from the traffic mire to face a positive sand famine, says the Dow Daily Building Reports. The only available supply of building sand in this market the week of February 15 was that brought over to this country as ballast from Europe in ships returning light. No one remembers when there was a greater demand for this building commodity, gravel, grit and crushed stone, and no one seems to be able to recall when the supply has been so low. The pits were frozen, the quarries were unworkable and the waterways were impassable with ice, and the only hope for relief was in the prospect for weather mild enough to permit reopening of the plants at pits and quarries or the prompt arrival of a large fleet of ships in ballast or both.

Storm stress caused a set-back in building work of all kinds. Alteration work was about all that was moving for ten days, although the strike of certain of the trades now in the recent wage scale agreement helped to retard new work.

Only "Cost Plus" Contracts

Financial interests say they see little expectation of general housing relief this year for two reasons. One is that there appears to be a constantly increasing price noted in estimates for new construction work, the disposition of a growing number of contractors to accept only "cost plus" construction operations (with a glaring uncertainty as to the ulimate cost of the operation in the present market for building materials and services) and the effect upon mortgage money of present systems of federal taxation which prohibits mortgages from competing with government tax free securities.

The clearest prospect of the present year is that many firms who are oversold now on materials and equipment will be actively following the market for new business before the year ends, unless prices of materials and equipment become immediately stabilized, delivery conditions improve speedily and some change is effected whereby mortgage money may have more active interest in realty investment.

Causes Much Work to Be Deferred

The best opinion in the building industry is that the long-looked-for price plateau in the materials market is at hand, or, at least, not far distant, perhaps a matter of weeks, certainly not much farther off than a month, if present trade indications count for anything.

The sudden turn about in the building outlook is due to the great number of building projects that have been indefinitely deferred because of the prohibitive bids made for building materials and the cost of construction, based upon preliminary estimates. The volume of this construction work that has thus been deferred is greater than is generally supposed and it is due to the outspoken word of financial men against further advances in cost of material and construction that has at last stopped the stampede for building materials, eased up the demand upon manufacturers and is shown the way toward a condition of stability of prices during the spring season at least or until the actual peace of the 1920 spring building movement can be actually determined.

Lehigh Valley Cement Mill News

ALTHOUGH the heavy winter weather has gone to handicap operations at the cement plants in the Lehigh Valley district of Pennsylvania, the different mills have made the best of the conditions, maintaining production at a good status. The Alpha Portland Cement Co. is now operating its plants at Alpha, N. J., Cementon, N. J., Jamestown, N. Y., and Manheim, W. Va. The Martin's Creek plant of the company has not as yet been placed in service, but it is planned to add this works to the operating quota in the near future. The Atlas Portland Cement Co. is active in production at its Northampton plant, while the Pennsylvania Cement Co. is maintaining a good plane of manufacture at its mills near Bath. The Vulcanite Portland Cement Co., Vulcanite, N. J., placed its No. 2 mill in service early in February; the plant has been idle for some time past, and will be continued on the producing list indefinitely. The various cement companies in this section have recently advanced the wages of employees. At the Atlas mill the advance aggregates about 10 per cent, affecting over 2,000 workers, while at the various Alpha plants the increase is 3 cents an hour.

New Southern Agricultural Limestone Plant

THE SOUTHERN LIME & MINERAL CO., after six months spent in developing and careful tests, is now constructing permanent works for the production of high grade agricultural limestone at Johnson City, Tenn.

The mill is located on the J. N. Long property, commonly called the old lead mine near King Springs.

The first unit of a capacity of 100 tons per day is now under construction. The building is located on a steep side hill and will have four different levels.

The crushers will be fed from the rock bins at the top, and the material will drop automatically through the machines for the different processes and finally discharge into inclosed storage bins at the road. All machinery will be run by individual motors and will be a model milling plant in every respect.

Motor Truck Haulage Helping Car Situation

NECESSITY has driven the Universal Portland Cement Co. to make practically all its Chicago city deliveries from its Bloomington, Ind., plant by motor truck—a distance of 20-odd miles. Big trucks and trailers over a paved, level road handle about half a railway car load. It has been found that cement can be delivered on jobs in the south half of the city for just about the same price as if the cement was carried by railway, handled from cars to warehouse and trucked from the warehouse to the job.

Railway cars are so scarce right now that this company is loading all kinds of open-top cars it can get hold of, including hopper-bottoms. It costs an average of about $5 per car to plug up the cracks and openings with cardboard to make it possible to load them with cement in bags. Added to this is the cost of supplying waterproofed canvas tarpaulins, which, of course, are returned or at least are expected to be returned.

The Indiana Portland Cement Co., Greencastle, Ind., some 20-odd miles from Indianapolis, is making practically all its city deliveries by motor truck. The company is planning to duplicate at once its new mill, which was described in ROCK PRODUCTS January 3, 1920. It is hoped eventually to handle bulk cement from this plant by motor truck.

Several Ohio agricultural limestone plants are making farm deliveries of ground limestone in bulk by means of motor truck. In general, the radius of these truck deliveries is 17 to 20 miles.

There seems little doubt that any increase in freight rates on these commodities will result in the permanent loss of this business to the railways.

General News from Rock Products Markets

Estimates of Rate Increase

FIGURES RELATING to the investment of the railroads and the earnings for 1918 and 1919 are being scrutinized with more than usual care by those who were trying to find an answer to the question, "How much will the rate-making section of the new railroad bill cost those who pay the freight bills?"

The Commission, in its annual report for 1918, estimated the property investment of the railroads of the country to be $19,005,055,288. That was the reported investment of the companies in road and equipment—which constitutes the property devoted to the service of transportation. Estimates as to the increase in property investment made in 1919 vary considerably, but few of them place it at less than $500,000,000, so that in round figures the investment last year was $19,500,000,000.

The rate-making section directs the Commission to make rates high enough to bring in a minimum return of 5.5 per cent. The Commission may make the return as high as 6 per cent, the extra half cent to be devoted to the creation of a fund for the providing of non-productive property.

In 1919 the class I roads of the country, which handle about 95 per cent of the business of the country, had a net railroad operating income of $515,793,287, as reported by the Commission.

Should the Commission decide to allow 5.5 per cent on $19,500,000,000, the estimated property investment in 1919, the net would have to be brought up to $1,072,500,000. If it decided to allow 6 per cent, the sum would have to be $1,170,000,000.

The freight operating revenue of the class I roads in 1919 was $3,556,734,373; passenger revenue, $1,178,119,954. The revenue from other operating activities brought the total to $5,184,230,244.

The big question now that the bill has become a law will be as to whose move it will be in the matter of initiating rates. The railroad executives, most of whom opposed the Warfield scheme, which, considerably modified, was written into the bill, months ago, appointed committees to propose schemes for raising rates. Not much has been published about the work of those committees. Estimates of increases running as high as thirty per cent have frequently been suggested, but, so far as known, they were not made by the committees, although the members of them are believed to have had definite percentages of increases placed before them with instructions to prepare schemes that, if allowed to become operative, would produce the revenue measured by the definite percentage tests.

Th prospective law says the Commission will "initiate." The query is as to whether, in view of that language, the executives will go ahead with their plans or whether they will await suggestions from the Commission as to how that part of the law is to be executed.—The Traffic World, Washington Bureau.

Hough Resigns from Staff of National Lime Association

NORMAN G. HOUGH, secretary of the National Lime Association, has resigned, effective February 29. Mr. Hough has been prominently identified with the lime industry for several years, being the manager of the Hydrated Lime Bureau throughout its life. When the National Lime Association was organized in 1918 Mr. Hough became manager of its construction bureau. When the association was reorganized last October he was made secretary.

In announcing his resignation, Charles Warner, president of the association, writes as follows:

"Mr. Hough has served our national association honestly and industriously for nearly six years. Throughout these many years of service it is gratifying to look back on the excellent and harmonious work of such a man. From beginning to end the relations of Mr. Hough and all of our various staff members and officials have been most harmonious and agreeable. He leaves us with deep regret and sincerest feelings of regard on all sides.

"It is quite unfortunate for our association that Mr. Hough has found a larger and better business opportunity elsewhere than our association is in position to offer. We shall regret the loss of his counsel in the conferences of our staff committee and we feel certain that all the members of the lime industry will join us in following with appreciative interest his development in his new work.

"The secretarial and other duties performed by Mr. Hough are being temporarily realigned in consultation with the special committee on staff and office organization, authorized by our board of directors, which committee meets within a week. We will work out the necessary plans for continuing all of these duties without interruption and we trust that the new plans will meet with the entire satisfaction of our members.

West Coast Building Material Shortage Is Critical

ON THE PACIFIC coast there are predictions of even higher prices for building materials and no prospect of any reduction in the cost of road work and building construction for some time to come.

The delivery of material for construction work during the month of January, always considered the slowest month in the year, breaks all records in the San Francisco Bay district, so far as the writer is able to learn.

The shortage of building materials seems to be greater than ever and more and more builders are being forced out of the building business because they cannot get materials.

There is apparently no possibility of wages coming down for several years to come to any appreciable extent, and until they do there is no hope of reduction in the cost of quarry products. With everyone willing to pay premiums for quick delivery prices are bound to stay up.

State Highway Departments Want Other Government Equipment

TO DATE THE War Department has turned over to the United States Department of Agriculture approximately 24,000 motor vehicles, as provided in congressional legislation empowering the latter department to distribute this war material among the state highway commissioners for use in road building, allotments of the vehicles to be based on the amount of Federal aid for roads which the states receive. This is practically all the vehicles which the War Department has to release. Of this total 12,000 have been delivered to the states. The remainder will be distributed as fast as railway cars can be secured for their transportation.

The state highway commissioners are also interested in securing allotments of tractors, steam shovels, locomotive cranes, automotive cranes, industrial railway track, dump cars, and industrial locomotives which remain to be disposed of by the War Department. A measure known as the Kahn Bill, directing the Secretary of War to release this material for the state highway commissioners, has passed the Senate and has been reported out of committee in the House. Until the Secretary of War has been directed by Congress to turn over this equipment it is not likely that it will be available for State distribution.

Some of the Problems of Plaster

More Uniformity in Product Needed—Function of Sand—Factors Affecting Strength and Density

By Thomas W. Cappon

Consulting Chemist and Engineer, Denver, Colo.

IN CONSIDERING the subject of building materials there are two points which the practical man, whether manufacturer or builder, is careful to bear in mind, namely, uniformity of product, as well as excellence of quality, and both are necessary to secure the best results.

In the case of lime and gypsum plasters uniformity of product is not always easy to secure owing to variation in the character of the raw material, for the quality of the rock may vary owing to the nature of the deposit, and seriously affect the quality of the plaster made from it, or a still more common cause—changes may occur in the process of manufacture, owing to the method followed, or the lack of method.

In gypsum plaster manufacture, more than one observer has noted defects in existing methods, and looked forward to radical improvements in plant and apparatus more in keeping with the advanced state of the mechanical arts of our day.

Lack of Uniformity

Viewed from a chemical standpoint, the need for improvement becomes still more manifest, when it is realized (though it is doubtful if it is realized) that in a sample of commercial plaster made by the usual process, there may be present as many as four or five different kinds of plaster, all varying in proportion from day to day. Under such circumstances, the difficulty of securing uniformity of product is evident for such variations cannot occur without affecting the working of the plaster.

Of course, where the plaster has gone "off," as it is called, it will eventually show in the working, but it is then too late to remedy; nor will it suggest the remedy. Neither will chemical analysis alone do it, though that is often resorted to. The fact is, the correct valuation of a sample of commercial plaster is a much more complex affair than it was formerly supposed to be.

In the larger plants some attempt is made to provide safeguards here, and there is a growing tendency by the use of elaborate contrivances to bring the process more and more under control, so that variation will not occur, or, if it does, that it may be at once detected by an experienced eye. In other plants, however, the attitude towards such devices might be described as "blissful," they are regarded as troublesome "contraptions," the calciner knows nothing of them, and the "boss" cares nothing for them.

Some Practical Difficulties

There are numbers of difficulties that exercise the mind in the progressive manufacturer desirous of securing the best product obtainable from his plant, some of which the writer proposes to discuss, and if possible, answer in these pages. They have been selected because they are typical questions, illustrative of the difficulties that arise in manufacturing practice, and concerning the correct answers to which there seems to be considerable uncertainty. As they sometimes go beyond the immediate subject of plaster manufacture and require a brief glance at the chemistry of building materials, that phase will be dealt with as plainly and briefly as possible.

One of these questions which frequently comes up is: "What is the effect of sand or other insoluble material upon plaster made from gypsite or other insoluble rock?" Strictly speaking, neither gypsum nor the more impure variety, gypsite, is "insoluble."

It is unfortunate for some purposes of the builder's art that this is so, otherwise it might be used for many purposes from which it is now excluded, for which its plasticity, color and rapid set would permit the most beautiful decorative effects; but, as it has the serious drawback of being affected by water and weather, its use is limited to interior work. Were gypsum weather resisting, however, it would be insoluble, and the phenomenon known as "setting"—due to its solution and recrystalization—could not take place.

The chief purpose of sand in connection with it is to act as a hardener and filler. Sand will not swell when mixed with water, as lime and retarded plaster do, ,consequently it will not shrink and "check" when that water dries out, an effect especially noticeable in the case of lime putty, owing to the great diminution in volume caused by the loss of water.

Effect of Sand in Plaster

The "neat stuff" of mortar, whether lime or plaster, is intended to little more than fill the voids of interstices between the sand particles (and, of course, act as a binder), this is the reason for the oft observed result that a rich mixture is more apt to check or crack than a poorer one. But, it may be further asked: "What, from a chemical standpoint, is the effect of sand on the gypsum plaster?" The answer is, none whatever. It quickens the set, but that is a physical rather than a chemical effect.

The reason is that sand as an insoluble body is for the most part inert or inactive, though when brought in contact with a power-base like lime hydrate there is, it is true, after long periods of time, a partial combination between the two, an effect which is seen in the old Roman masonry, or, to use a more modern instance, in the hardening cylinder of a sand-lime brick plant. In the latter case owing to the great heat and steam pressure the chemical affinities are so quickened that the union becomes a matter of hours (usually eight or twelve) instead of ages.

But such union in the case of gypsum cannot take place because the latter is what chemists call a "saturated compound," the strong base lime is already neutralized and combined with a powerful acid, sulphuric acid, ,and the latter cannot be displaced under ordinary conditions by the sand (silicic acid).

However, that reaction, like many other chemical reactions, is "reversible" under changed conditions, in the heat of a reverberatory furnace, for instance, when the sand (silicic acid) can displace the sulphuric acid and send it off in vapor. Such a method has in fact been proposed as a means for recovering the immense stores of sulphuric acid locked up in gypsum rock. Luckily there are cheaper ways of obtaining that body, without ample supplies of which there would be a general paralysis of the chemical industries, as sulphuric acid lies at the base of so many of them. Still better than gypsum, however, would be the variety of it known as "Anhydrite," useless for plaster making, as it will not set when calcined, and is often mistaken by the quarrymen for gypsum, and is thus a frequent source of grief to the manufacturer and a sort of white elephant on his hands, as there are hundreds of tons of it for which he can find no outlet.

Fineness of Grinding

The question of the fineness of plaster

is another point on which differences of opinion exist, some manufacturers grinding to a finer and others to a coarser mesh. Which is better, a fine or a coarse plaster, so far as sand-carrying quality is concerned? Generally speaking, a finely ground plaster is stronger, will carry more sand and work better than a more coarsely ground one, but in practice a limit is always reached beyond which it does not pay to grind, because the mill's output is thereby lessened and the cost of production increased.

Before leaving the subject of fineness, there are some curious points in connection with it that are of interest to the manufacturer, and suggestive, too, when there is question of radical improvement in mechanical plant and process of manufacture. To illustrate: Take two portions of gypsum rock, one of which is finely ground before calcination, and the other coarsely ground.

After calcination, regrind the second portion to the same degree of fineness as the first portion. Of these two samples the second will make the stronger and the better plaster. The practical bearing of this fact, which is open to dispute, I suppose, but of which the writer is confident, is obvious; but lest it should not be sufficiently clear to the reader, it is suggested that the above is one of the points that plaster makers using rotary kilns (now coming into use in this country) should be able to turn to good account. And there are other points, it is necessary to add, however, where the older (kettle) process possesses an advantage inasmuch as its product contains no sulphide.

Some Perplexing Questions

Another question on which the hopes of the plaster maker have centered, and which has engaged the attention of technical experts more of late than any other, is: "Can lime plaster be made to set up and harden quickly like gypsum plaster, if not, is the difficulty insoluble?"

Another is: "Is there any relation between the specific gravity and the strength and setting time of the set plaster?"

Taking the last question first, it may be said the "set" of plaster depends on an entirely different factor, namely, the temperature at which it was calcined, and it may be changed at will by varying that factor.

In regard to the strength, there is a direct relation between that and the specific gravity. As a rule, the greater the specific gravity, the greater the strength. There is a good reason why this should be the case. Perhaps the following will make the matter clear: Ground plaster of paris does not always take up the same amount of water in reaching the proper consistency for working. That proportion varies with different plasters and depends on several factors, such as the temperature of calcination, the age of the plaster and the proportion of inactive material it contains.

When the plaster requires an unusually large amount of water to attain the proper working consistency it will be found after setting and drying out to be of a lighter specific gravity, it will be more porous and weaker in strength than if it had absorbed less water, its sand carrying power will also be less. Air spaces between the molecules convey no strength, though they affect the sound carrying qualities as well as the heat conducting power.

In a future communication the writer hopes to deal with some more of the difficulties that arise in practice.

Crushed Stone to be By-product of Minnesota Iron Mine

Mesaba Iron Co. Will Operate 4400-Ton Per Day Quarry and Crushing Plant

THE BIG DEMAND for mineral aggregates for the hard road-building program of Minnesota has been one of the causes of developing an immense deposit of low-grade rock iron ore in the Mesaba iron range country. The deposit consists of silica rock with bands of high-grade iron ore scattered through it. The rock will be crushed and put through various concentrating processes until the gradual elimination of the silica makes fine grinding economical. The by-product of the concentrating processes is crushed rock and crusher sand. Two and one-half tons of rock are required to make one ton of ore, so that for every ton of iron ore turned out there will be 1½ tons of commercial crushed stone.

Demand for Crushed Rock

The "Iron Age" of January states:

"There is a heavy demand in Minnesota for crushed rock for concrete roads, that state having undertaken a hard surfaced highway project that is more ambitious than any elsewhere in contemplation, anticipating the expenditure of not less than $10,000,000 a year for many years. It is said that, contrary to what might be supposed, the available quantity existing in Minnesota of either crushed rock or of gravel suitable for concrete is not large.

"The company owns or controls about 15,000 acres in the east Mesaba district and a considerable further acreage elsewhere, also containing a magnetic ore suitable for the production of a low phosphorus product. Part of the Mesaba property is what was at one time known as that of the Mesaba Iron Co., a concern organized soon after the Civil War, and antedating by many years any other iron mining corporation in Minnesota. It was then supposed, and thereafter until this present company attacked the situation with its eye single to the concentration of vast bodies of low grade material, that there existed in this area natural concentrations of high grade iron ore similar to what was later found to exist on other parts of the Mesaba range. Many explorations were carried on in various portions of this tract looking for such ore bodies, but always without success. The thousands of exposures of glistening, steel-like ore scattered for miles over this property gave rise to this belief, but these exposures were thin bands of the formation, weathered or eroded to the hard, high grade, thin seams. The entire deposit is of this banded character, these bands being at a dip with the general dip of the formation, and it is this banded nature that permits successive concentration and the gradual elimination of silica until the more expensive fine grinding takes place on a high grade crude and leaves a product suitable for sale as crushed rock. Mining will be done by hard rock quarry methods, and practically without stripping."

Research Work by National Lime Association

PLANS ARE BEING MADE by the National Lime Association for the employment of a research chemist whose duties will involve extensive investigations into the use of lime in various chemical manufacturing industries. The objects of these researches will be to ascertain facts regarding the chemical uses of lime which may result in either improving existing practices or developing new uses for and applications of lime.

This is an important phase of the enlarged program of activities decided upon by the board of directors of the National Lime Association at its last meeting and will be of interest to consumers as well as producers of lime.

Several subjects have been scheduled for investigation and any suggestions as to useful lines of effort will be gratefully received, according to an announcement received from the association headquarters in Washington.

Portland Cement Production, 1919

Large Increase Over 1918 in Production and Shipments

PRELIMINARY ESTIMATES compiled by the United States Geological Survey, Department of the Interior, indicate that the production and shipments of Portland cement in 1919 increased 13 and 21 per cent, respectively, over those in 1918 and that the stocks decreased 52 per cent, so that at the end of 1919 less than 5,000,000 barrels of Portland cement was in stock at the mills. The Portland cement industry was set back considerably in 1918, when war restrictions reduced the shipments from the 90,703,474 barrels shipped in 1917 to 70,915,508 barrels, but it is now regaining its lost ground. Early in 1919 the business was even poorer than in 1918, and practically all the increase reported was made during the latter part of 1919, so that 1920 started with favorable prospects for the cement industry. During 1919 the shipments from some mills were limited by the lack of freight cars. The increase in the value of the cement shipped in 1919 over that shipped in 1918 was about 28 per cent.

The shipments of Portland cement in 1919 amounted to 85,485,000 barrels, valued at $144,461,000; the production amounted to 80,287,000 barrels; and the stocks at the mills at the end of the year amounted to 4,976,000 barrels.

One new plant produced Portland cement in 1919—the Indiana Portland Cement Co., at Greencastle, Ind. The total number of plants that produced cement in 1919 was 110, and the total number of plants that shipped cement was 113. The average factory price per barrel for Portland cement in bulk in individual States in 1919 ranged from $1.57 in Kansas to $2.03 in Utah. The average factory price for the whole country in 1919 was $1.69, an increase of only 6 per cent over 1918.

The exports of hydraulic cement from the United States in 1919 amounted to 2,463,689 barrels, valued at $7,516,019, or $3.05 per barrel, increases of about 9.27 and 16 per cent, respectively, over 1918.

Estimate of output of Portland cement in the United States in 1919, with actual figures for 1918, by States.

State.	1918	1919	Percentage of change in 1919.	Average factory price per barrel in 1919.	Percentage of change in price in 1919.
	Barrels.	*Barrels.*			
California:					
Shipments	4,238,424	4,505,000	+6	$1.95	+17
Production	4,354,074	4,531,000	+4	.....	.....
Stock	528,026	464,000	−12	.....	.....
Illinois:					
Shipments	3,703,471	4,863,000	+31	1.62	+5
Production	3,594,038	4,166,000	+16	.....	.....
Stock	646,255	3,000	−99	.....	.....
Indiana:					
Shipments	6,205,326	7,651,000	+23	1.64	+6
Production	5,291,851	7,120,000	+35	.....	.....
Stock	822,888	314,000	−62	.....	.....
Iowa:					
Shipments	3,188,669	4,561,000	+43	1.69	−1
Production	3,626,455	3,661,000	+1	.....	.....
Stock	1,065,540	81,000	−92	.....	.....
Kansas:					
Shipments	2,556,534	3,083,000	+19	1.57	−4
Production	2,499,723	2,935,000	+17	.....	.....
Stock	326,273	166,000	−49	.....	.....
Michigan:					
Shipments	3,618,088	4,935,000	+36	1.70	+1
Production	3,554,872	4,620,000	+30	.....	.....
Stock	635,447	328,000	−48	.....	.....
Missouri:					
Shipments	4,515,695	5,609,000	+24	1.66	+5
Production	4,738,596	5,157,000	+9	.....	.....
Stock	676,352	103,000	−85	.....	.....
New York:					
Shipments	4,074,159	4,274,000	+5	1.66	+3
Production	4,095,588	4,140,000	+1	.....	.....
Stock	832,271	638,000	−23	.....	.....
Ohio:					
Shipments	1,289,887	1,864,000	+45	1.74	+2
Production	1,440,859	1,762,000	+22	.....	.....
Stock	262,142	143,000	−45	.....	.....
Oklahoma:					
Shipments	1,218,841	1,405,000	+15	1.88	+4
Production	1,246,515	1,404,000	+13	.....	.....
Stock	89,188	67,000	−25	.....	.....
Pennsylvania:					
Shipments	22,238,689	26,419,000	+19	1.62	+7
Production	22,628,901	25,222,000	+12	.....	.....
Stock	2,840,810	1,703,000	−40	.....	.....
Texas:					
Shipments	1,918,919	2,288,000	+19	1.83	+6
Production	1,971,867	2,230,000	+13	.....	.....
Stock	289,779	233,000	−20	.....	.....
Utah:					
Shipments	549,593	934,000	+70	2.03	+21
Production	570,310	801,000	+40	.....	.....
Stock	133,465	21,000	−84	.....	.....
Washington:					
Shipments	1,116,754	1,441,000	+29	2.01	+8
Production	931,489	1,438,000	+54	.....	.....
Stock	214,220	197,000	−8	.....	.....
Other States:a					
Shipments	10,452,159	11,683,000	+12	1.74	+7
Production	10,536,525	11,100,000	+5	.....	.....
Stock	1,101,094	515,000	−53	.....	.....
Total:					
Shipments	70,915,508	85,485,000	+21	1.69	+8
Production	71,081,663	80,287,000	+13	.....	.....
Stock	10,453,950	4,976,000	−53	.....	.....

a 1919: Alabama, Colorado, Georgia, Kentucky, Maryland, Minnesota, Montana, Nebraska, New Jersey Oregon, Tennessee, Virginia, West Virginia. 1918: Same States except Nebraska.

Cement Industry in India

THE EXTENT to which cement is required for public works and construction work generally in India is shown by the imports which, for the three years prior to the war, 1912-14, averaged about 3,000,000 hundredweight per annum, of which 84 per cent came from the United Kingdom and the remainder from Germany, Belgium, Italy, Austria, and Hongkong. Until 1914 the manufacture of cement under modern methods had not been started in India, although a small amount of fair quality was being made for local use in one or two places, but within the past three years a few firms have installed modern plants and started manufacturing cement by scientific methods. However, although war conditions have given a great impetus to this production, the combined output from the three principal Indian manufacturers is at present half, or less than half, the amount imported into the country prior to the war.

Leading Companies Producing Cement

Bundi Hydraulic Lime & Cement Co. (Ltd.).—The works of this company, one of the three important Indian manufacturers of cement, are situated amidst hilly country at Lakheri, in Bundi State, Rajputana, on the Bombay, Baroda, and Central India Railway, 250 miles south of Delhi on the Nagda-Muttra section. The company, which resulted from the accidental discovery of large quantities of limestone deposits at Lakheri at the time of the construction of the Nagda-Muttra section of the railway, has a lease of 101 square miles. Its present rotary kiln plant was started in September, 1916, with a staff of manager, chemist, engineer, and burners, Europeans experienced in cement manufacture, and Indian clerks as office assistants.

The deposit of argillaceous and semipure limestone furnishes a plentiful supply of raw material. Gypsum, for use during the process of grinding is imported from Jodhpur and Rerwar. The argillaceous content of the limestone introduces the requisite clay properties and coal is supplied by the Bengal coal fields.

Estimate of output of Portland cement in the United States in 1919, with actual figures for 1918, by districts.

District.	1918	1919	Percentage of change in 1919.	Average factory price per barrel in 1919.	Percentage of change in price in 1919.
	Barrels.	*Barrels.*			
Lehigh district (eastern Pennsylvania and New Jersey):					
Shipments	19,351,123	23,630,000	+22	$1.63	+
Production	19,701,820	22,614,000	+15		
Stock	2,512,123	1,546,000	−39		
New York State:					
Shipments	4,074,139	4,274,000	+ 5	1.66	+ 2
Production	4,095,588	4,140,000	+ 1		
Stock	832,271	638,000	−23		
Ohio and western Pennsylvania:					
Shipments	6,231,702	7,164,000	+15	1.63	+ 6
Production	6,439,179	6,726,000	+ 5		
Stock	845,573	375,000	−56		
Michigan and northeastern Indiana:					
Shipments	4,183,260	5,421,000	+30	1.70	+ 2
Production	4,106,467	4,990,000	+22		
Stock	790,495	372,000	−53		
Southern Indiana and Kentucky:					
Shipments	1,960,109	2,644,000	+36	1.65	+ 2
Production	1,609,475	2,455,000	+50		
Stock	216,242	55,000	−69		
Illinois and northwestern Indiana:					
Shipments	7,894,542	9,884,000	+25	1.62	+ 6
Production	7,169,038	8,945,000	+25		
Stock	1,088,773	218,000	−80		
Maryland, Virginia, and West Virginia:					
Shipments	2,308,193	2,628,000	+39	1.73	+ 7
Production	2,281,629	2,462,000	+ 8		
Stock	268,384	108,000	−60		
Tennessee, Alabama, and Georgia:					
Shipments	3,092,425	2,780,000	−10	1.69	+11
Production	2,990,734	2,727,000	− 9		
Stock	118,988	69,000	−42		
Iowa, Missouri, and Minnesota:					
Shipments	8,712,597	11,575,000	+33	1.67	+ 2
Production	9,478,051	10,102,000	+ 7		
Stock	1,937,902	267,000	−86		
Nebraska,[a] Kansas, Oklahoma, and central Texas:					
Shipments	5,365,848	6,387,000	+19	1.70	+ 1
Production	5,370,181	6,184,000	+15		
Stock	654,876	419,000	−15		
Rocky Mountain States (Colorado, Utah, Montana, and western Texas):					
Shipments	2,175,874	2,972,000	+37	2.00	+ 8
Production	2,288,953	2,772,000	+21		
Stock	375,042	213,000	−43		
Pacific Coast States (California, Washington, and Oregon):					
Shipments	5,565,676	6,126,000	+10	1.98	+14
Production	5,550,548	6,170,000	+11		
Stock	783,479	696,000	−11		
Total:					
Shipments	70,915,508	85,485,000	+21	1.69	+ 6
Production	71,081,663	80,287,000	+13		
Stock	10,453,950	4,976,000	−52		

[a] No output in 1918.

Sampling and testing, which are done carefully and systematically at each stage of the "dry" process of manufacture of these works, and during the packing in bags of the finished cement, reveals that a very complete adjustment of mixture takes place, producing a cement uniform in quality, with unusually excellent tensile resistance, and equal to the best British brands. This company maintains an annual output of 26,000 tons.

Katni Cement & Industrial Co. (Ltd.).—This firm was the earliest of the three in the field, the electrically equipped plant having been completed in 1914. The works are situated in Tikuri village, occupying a very favorable site close to the main East Indian Railway line 2½ miles from Katni Junction.

Native labor, to about 2,000 employees, is obtained mainly from the surrounding district and is fairly constant except at such times when crops are being harvested and sown. Houses for a large number of the workers in the firm are in course of erection by the company.

Large supplies of limestone are to be found in the immediate neighborhood, and soft water is obtained from a river about half a mile from the works. The supply of clay is practically inexhaustible and is rich in silica. Coal is one of the chief items of expense in these works, as from 27 to 30 per cent, exclusive of that which is used in the power house, is burned per ton of cement.

By means of the "wet" process, this "Castle Brand" of cement was produced in 1916 to the amount of 31,000 tons, which output is increasing yearly. Trouble, which was experienced at first, over the question of setting time, has been overcome by the firm, and tests from time to time have shown that the tensile strength of the cement is uniformly high and equal to that of first-grade English production.

The Indian Cement Co. (Ltd.).—These works are situated at Porbandar, Kathiawar, a Native State under British administration, on a site adjacent to the docks with a wharf frontage, so that cement can be shipped direct into steamers or native craft for distribution to ports in India, Persia, etc., and within easy access to railway connections.

The staff of manager, chemist, both Europeans, two assistant chemists, chief engineer, two assistant engineers, and a workshop foreman, finds no difficulty in obtaining unskilled and semi-skilled labor of the class required. Substantially-built quarters are provided for these 350 laborers.

An ample supply of hard water is present, that for boiler use having first to be softened. A practically inexhaustible supply of limestone, which is almost pure, is available in the quarries from which the famous Porbandar limestone, used so much for building purposes in Bombay, is obtained. These are situated near Ranawao, some 13 miles from the works, chips being forwarded by rail, at present sufficient in amount for the factory's needs for 40 years. Clay beds of a uniform composition occur near the works to the north and east, covering an area of several square miles, and ranging from 6 to 10 feet in depth. The present development of gypsum deposits on the marshes within a few miles of the works supplies about half the factory's requirements, the balance being obtained from other places in Kathiawar.

The "dry" process, with vertical kiln, is employed, and the present output of the works is at the rate of 20,000 tons per annum. Porbandar "Ganapati Brand" cement is sound, reliable, and suitable for all classes of work, though of somewhat lower strength than rotary kiln cements, which fact renders it not so economical in use. A rotary kiln, to be installed at an early date, has already been purchased by the company with a view to bringing their product into line with other cements of higher tensile strength.

Equipped to Produce High-Grade Cement

India, in the possession of these three factories, all modern concerns, located in convenient and advantageous sites, efficiently staffed, and under expert European management, is thus thoroughly equipped for the manufacture of a high-grade cement. This ready competition with any first-class product of other countries should remove all prejudice against Indian brands of cement and lead to an expansion of the industry in that country.

Census of Mines and Quarries

WASHINGTON, D. C.—A census of mines and quarries will be included in the census of manufacturers which is to be taken by the government in March. Complete statistics of all industries are to be gathered, including information regarding the number of workers employed, their hours and the wages paid.

This will be the first manufacturing census to be taken since 1914, when about 400,000 plants were listed, and it is expected that this year's count will show a great increase in the number of industries in the country.

Considerable interesting and valuable information will be secured by the coming census. At the time of the last inquiry, business was just beginning to feel the depressing effects of the outbreak of the war. Since then business has had to reorganize three times, to meet the exigencies of the situations occasioned by the war, our entry into it and the conclusion of the armistice.

Contractors Meet in Chicago

Car Shortage and Limited Supply of Labor and Materials Receive Much Consideration by Representatives of Country's Biggest Construction Firms

THE ANNUAL MEETING of the Associated General Contractors of America was held in Chicago, February 18 and 19. This association has grown very rapidly both in numbers and power. Besides maintaining a headquarters' office and staff in Chicago, a Washington, D. C., office has also been maintained and a monthly magazine has been published in New York.

Some Problems That Face Producers

The two-days' sessions were in no small measure devoted to discussions of identically the same problems that the building material producers are trying to solve. It was evident that the contractors have a very vital interest in the transportation problems of freight rates and car shortage and are preparing to put up a stiff fight on their own account. The sum of $150,000 was pledged at this convention to carry out the work of the association in 1920.

Samuel O. Dunn, editor of the "Railway Age-Gazette," gave an address on the seriousness of the railroad situation, and gave very little encouragement for much improvement in the near future. He said the amount of business handled by the railroads in the last ten years actually had been increased about 50 per cent, with practically no increase in facilities, and that the limit of present facilities had about been reached.

Railways Need Capital

Mr. Dunn said the most vital problem before the country today was the financing of about $600,000,000 worth of railway improvements per year for the next ten years. He pointed out the effect of inadequate railway facilities in limiting cement production in 1919, and said it was absolutely senseless to put capital into industries for increasing production when no capital was being put into the railways to provide for handling this increased production.

Mr. Dunn believed that under the Cummins-Esch railway law there would be many voluntary consolidations and that railway securities would greatly appreciate in value. He believed there would be some increase in the efficiency of operation, but the real kernel of the problem was more equipment and facilities. Richard Waterman, secretary of the Railroad Committee of the Chamber of Commerce of the United States, spoke in a similar vein.

How Long Will Present Boom Last?

Harold C. Moulton, professor of economics, University of Chicago, who has written and spoken a great deal on the present-day economic situation, left the impression that we were not far distant from a period of panicky conditions. He made it clear that the present cycle of high prices and high wages was adding constantly to the cost of doing business and the subsequent expansion of credits, as all modern business is done on credit. He said the present gold reserve was about as low as it has ever been and that the cash reserves of the Federal Reserve Banks were almost down to the minimum required by law. He said there was every indication of increased interest rates on bank loans, but that up to this time this means had not helped to prevent speculation.

Limiting Factors in Labor Supply

Prof. Moulton defined the three limiting factors in labor supply (*not supply of laborers*) as: (1) Shortage of labor due to loss of immigration; (2) reduction of working hours (which resulted in a 5 per cent increase in the number of jobs in 1919); (3) decrease in the efficiency of labor. This last factor he said was the biggest and (2) and (3) together made necessary the addition of 4,000,000 workers to accomplish the same output as before.

Prof. Moulton contended that the attempt to increase production by raising wages was an absolutely certain road to disaster; that it was impossible to go forward at the present price level. He predicted that building costs will very materially increase this year, that a horizontal increase in freight rates coupled with inadequate transportation service will send building prices sky-high. He said the building shortage was the most serious it had ever been, but doubted seriously if buildings could be constructed under these conditions and prove profitable investments.

Illinois Highway Experience

Frank I. Bennett, director of the Illinois Department of Public Works, said quite frankly that notwithstanding the popular clamor for better roads his department was seriously considering a policy of retrenchment until the peak of high prices had been passed. He said that bids for road work this year were averaging 50 per cent higher than last year, when everyone thought the peak of prices had been reached. He thought the principal cause of this great increase in contract bids was the uncertainty of being able to work continuously on account of the car shortage.

Mr. Bennett admitted that he was still considering a state cement plant, and he predicted that foreign-made portland cement would soon enter our ports again. He has not been able to get bids for more than half of the cement he figures the state will need if the whole 1920 road program is lived up to.

Cement Situation

Blaine Smith, of the Universal Portland Cement Co., Chicago, was called upon to give the facts about cement production. He said that the maximum possible production of the present portland cement mills was about 140,000,000 bbls. per annum; that 93,000,000 bbls. was the most thus far produced in any one year.

This year the usual conditions in the cement industry at this time of the year are reversed and instead of having large stocks ahead for spring shipments, the producers are unable to keep pace with orders as they come in. Many of these orders are attributed to frenzied buying by dealers and others who fear an acute shortage later on.

Mr. Smith said undoubtedly the limiting factor in 1920 production of cement would be the ability of the railways to move the material. He admitted that it would be impossible to produce and ship the amount of cement the country as a whole believes at this time it will want, but he believes that after things got to going at the pace other factors will set, that there will be no cause for worry over the supply of cement.

John H. Voorhees an Agricultural Editor

LIME MANUFACTURERS will be interested in the announcement that John H. Voorhees, recently of the faculty of the New York State College of Agriculture, Cornell University, is now a member of the editorial staff of the "Pennsylvania Farmer," Philadelphia.

Mr. Voorhees was for several years agronomist of the Agricultural Lime Bureau, Washington, D. C., and is a most thorough believer in and promoter of agricultural lime. He has been a frequent contributor to the columns of ROCK PRODUCTS and assurances have been received that he will continue.

Secret of Successful Sand and Gravel Pumping--the Pump

Also a Thorough Knowledge of How the Installation is Working and the Adaptation of Speed and Other Variables to the Local Conditions

BY FAR one of the most interesting discussions of operating problems at the recent convention of the National Association of Sand and Gravel Producers was that on sand and gravel pumping, led by R. Snoddy, manager of the Coon River Sand Co., Des Moines, Iowa.

Mr. Snoddy is a pumping enthusiast who has made a most thorough study of the subject from a practical standpoint, who builds his own pumps, and who is reputed to be one of the most successful operators in the Middle West. He said: "For any place where you are practically free from boulders—I have watched various kinds of operations—and for plants of less than 30 or 40 cars a day I have never found anything that would be anywhere near as economical as a pumping system."

Pump Design and Material

Mr. Snoddy is a firm believer that the design of the pump is more important than the material of which it is made. This is the point the editor tried to drive home in the brief article in ROCK PRODUCTS, January 3, 1920, describing Mr. Snoddy's operation. It was not the intention of that article to convey the idea that ordinary cast-iron outwears such a material as manganese steel under parallel conditions. When Mr. Snoddy builds his pumps of manganese steel, as he now intends to do, instead of ordinary grey cast-iron as at present, he expects them to last a lifetime.

He claims the unexampled life of his pumps is due to their design and their adaptation to his particular operation; but an analysis of his talk before the sand and gravel convention shows that there are other important factors than these, and that the life of *any* sand and gravel pump could be greatly lengthened by the same attention to operation that he gives. Consequently the article in the January 3 issue of ROCK PRODUCTS was incomplete and misleading in some details, especially as to the life of manganese-steel pumps, but its primary point—the design of the pump and its adaptation to its work—is as Mr. Snoddy testified at the convention—of very great importance.

Life of Sand Pumps

He said:

"I don't know that there is any reason why I should tell you about my own pump, because I don't build pumps to sell; but we have put in a good deal of time studying the proposition and have made a good many experiments, and in our experience previous to making our own pump we kept a tabulation for five years on the common cast-iron pumps that are sold ordinarily for sand dredging, and we found the average was about 600 cars to a shell. Then the shell was worn out. It was necessary to keep extra shells on hand all the time.

"Our pump, however, has never had but two shells replaced and both of those were broken in one week in undertaking to pump out an old bridge pier that was in our way. This bridge pier had been built with a cribbing. They put in boulders all the way from the size of your fist up to a half a ton. We were simply picking them up with a nozzle and dropping them into the boat to take them to the shore. The pump had been running at a very high rate of speed. It wasn't but a little time until we caught one of these boulders, or rather two of them, and they got wedged in the pipe and of course it made a hole in the side of the head casting of the pump.

"We thought it was just an accident.

R. Snoddy's operation on the Coon River at Des Moines, Iowa

We took that one out and put on another and after running about six or eight hours more we kicked a hole through that in the same way. Neither of those shells showed over 20 per cent wear. One of them had to its credit 7,200 cars and the other 7,500 cars. It showed conclusively that while they were not worn more than 20 per cent they had given better than twelve times the service of the common cast-iron shell. I have used two different makes of pumps and I found the life of them and the efficiency of them just about the same."

Operating Pointers

Mr. Snoddy operates his pump with a horizontal steam engine having no governor, so he can run the pump at any speed desired—a very essential feature in adapting the operation to conditions. This he does as follows, in his own words: "The first thing we do when we start up with a new length of pipe that we have not had experience with, instead of sitting down and measuring it and figuring it out theoretically according to elevation and friction and all these other things, we set the starter up on the water. We wheel the engine a little faster and a little faster until we get to the point of a complete solid stream leaving the end of the pipe clearly; and when the pump gives a good straight stream we set the red hand on the discharge gauge (indicating pressure gauge) to the point where the hand holds steady. That is the engineer's guide to operate at the speed that will keep his gauge up to that amount of pounds' pressure. That will vary with different types of material on the same distance.

"For instance, last summer we took a position where we were cutting crosswise of our original operations. A portion of our hole was what we call the wash-in material, old bed stuff that was just nothing more or less than good coarse sand. It was very easy to pick up and very easy to handle, while the other was wash-in that apparently had a large per cent of pretty good gravel. We found that it made about five points difference on this discharge pressure for the same amount of work, depending on whether it was heavy or light material.

"It is strange to say that heavy gravel carries through with five points less pressure than the sand because the sand stays together better, is more compact and will settle easier, while the gravel keeps itself loosened up, isolated, and if it is not kept in suspension, it will bounce along in the pipe and won't stop any way.

"A good many years ago I did a lot of reading up on all the theoretical and technical features of pumping. I used to figure out the length, the points of elevation and so on, but I learned that you get far better results to simply watch your operation and be governed according to the experience that is to be had rather than to work theoretically."

This, in a nutshell, is Mr. Snoddy's philosophy of successful sand and gravel pumping. Too often the operator purchases a pump, rated by the manufacturer to pump so much at so many revolutions per minute, runs it in any and all kinds of material with a constant-speed motor at the specified r.p.m., and then wonders why it wears out. It is obvious from Mr. Snoddy's experience that a cut-and-try process for each kind of material pumped and for each change in the length of the pipe line is vastly more important to economical operation than theoretical considerations.

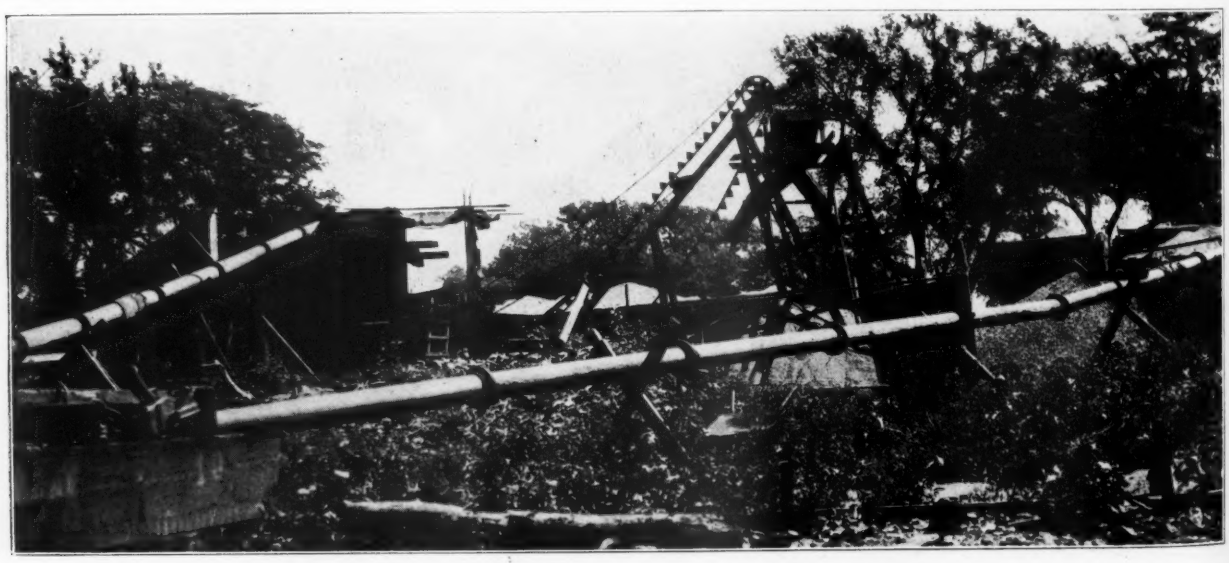
Some Other "Little" Considerations

In successful sand and gravel pumping it is the attention to a host of little details which makes the difference. Thus Mr. Snoddy said: "Now there are a great many little things in regard to a pumping proposition that almost anyone ought to know offhand. In the first place, your suction line must be absolutely air tight. Get your pump just as close down to the water as you can. If you are operating from a barge, put your pump down in the hull of the barge in one corner of your boat, with your pipe line, the suction line, sticking outside of your boat, and get to your material in the shortest distance possible from your pump.

"The part that cuts down on the efficiency of your suction is the part above water. The part below water, as is argued by some, doesn't count. It doesn't count so far as weight is concerned, but it does count for friction and in the speed adjustment. So you want to get just as close down to the water as you can.

"Your pump should have just as few elbows as possible. The power necessary to turn a 90-degree elbow is equal to the same power as would carry about 15 ft. on the straight line; that is, in a 10-in. pipe it works out to that point.

"The difference in the size of your pipe line makes slight variations. The larger the pipe line the less friction you have. There are some people who take a 10-in. pump and put a 12-in. pipe line on the discharge. It is true you cut down your friction for a given amount of water in a certain length of line, but when you increase the size of your pipe line for the same amount of water you slow down your velocity of discharge, which will cause it to carry a less volume of ma-



Showing short delivery pipes and the low heads pumped against

terial; and the fact is that the most of the material that is carried is dragging on your pipe and eating it up. The smaller your pipe, the more of a spiral effect of the water in going through it. That keeps your material suspended in the water so that you don't wear out your pipe very much.

"I don't say it boastfully, but I have just a common ordinary black iron pipe that has had upwards of pretty close to 10,000 cars run through it and it is not much over 50 per cent worn out, while I have other pieces of pipe where there are elbows, where the material is thrown directly against the sides, and they will seldom last for more than 800 to 1,000 cars before they have worn to the point where the threads begin to give way and won't hold.

"That shows the difference in keeping material wheeling through your pipe at a sufficient speed to keep it suspended all the time. If you stand around your pipe line and listen and can hear the sand dragging in the pipe all the time, you know you are not wheeling it fast enough; but if you keep it wheeling fast enough to keep it in suspension at all times, you will seldom hear the sand drag at all. Once in a while you will hear the heavy gravel go through, hitting the pipe here and there, but it is economical from the standpoint of wear on your pipe as well as the volume of material handled to wheel it through at a speed where it won't drag."

Mr. Snoddy gave much other practical advice, which will be abstracted in a subsequent issue.

New President of the National Sand and Gravel Association

Intimate Biography of a Live Wire

OHIO, proudly referred to by her numerous sons as the mother of Presidents, is the birthplace of the new president of the National Association of Sand and Gravel Producers, V. O. Johnston—born 47 years ago—on a farm (of course). Early developed a liking for rock products by having to pick them off meadows and hoe them away from hills of corn. At the age of 14 he was graduated from the district school in the middle of a term, at the insistent request of the teacher. In 1897 he managed to graduate from Oberlin College, with degree of A. B. In 1900 graduated from Law School of Western Reserve University at Cleveland, Ohio. Practiced law at Cleveland for seven years—and still dares to go back there.

In 1907 he became manager of the Lincoln Sand & Gravel Co., Lincoln, Ill. In 1911 he was fired as being "ignorant, inefficient and insubordinate." In 1912 he organized the Sabula Sand & Gravel Co., Sabula, Iowa. In 1914 regained control of Lincoln Sand & Gravel Co. In 1916 organized the Barry Sand & Gravel Co., Barry, Ill. Is now president and chief owner of the three concerns, and attends to business occasionally at Room 6, Scully Building, Lincoln, Ill.

In politics, he is Republican, and expects to see the party nominate for President a certain shrewd business man now Governor of a State situated near Chicago. He is married and has a son and three daughters, who reside in Oberlin, Ohio. He is a firm believer in Association work—was one of the organizers of the Illinois Association, the Iowa Association and the National Association.

V. O. Johnston
President National Association of Sand and Gravel Producers

Of the National Association he says: "It was born and cradled in Chicago. It has grown wonderfully and we are proud of its strength already. With a greatly increased membership and a strong financial backing, we expect its voice to be heard and its words respected from one Portland to the other. Its weakest member should find it a shelter in a time of storm and its strongest member an assurance of continued strength."

Pickups at Sand and Gravel Convention

A. G. GUTHEIM, of the division of operation, car service section,, U. S. Railroad Administration, proved himself a first-class diplomat by talking a long time, giving temporary satisfaction without having committed himself very much either as to the past, present or future. The most satisfactory impression that he left was to the effect of propaganda for government ownership on the railway executives. He thinks that the desire to justify private operation will be so strong as to temper demands for increased rates, and to furnish the incentive for economical management.

While admitting that sand and gravel shippers had "got it in the neck," he excused his own participation in the car service deal by explaining the superior organization of the coal operators, as compared with that of the sand and gravel producers. For this frankness he is certainly to be commended, and what he said undoubtedly was very effectively used in the arguments for a decent budget for the national association.

PROF. T. R. AGG'S paper on "Standard Sizing of Sand and Gravel" tended to offset some of the effects of the proposed scheme of the national Portland Cement Association for using any and all kinds of aggregate. Prof. Agg said that while the use of such material might be logical in some instances, practical considerations would very greatly limit the use of anything but arbitrarily proportioned mixtures. He pointed out that frequent variation of the mix to suit the proportions of an unscreened or unsized aggregate meant very difficult administrative work for the engineering departments and more concrete inspectors than the country afforded.

Prof. Agg thought the three considerations in making concrete were, in their order of importance, as follows: (1), concrete of the desired strength; (2), insurance that the bidder would have an easily understood basis for computing the quantities of his materials; (3), use of any suitable materials available.

SCOTT BOND, of Madison, Ark., who described himself as a "nigger" and ex-slave, furnished several minutes of very interesting and profitable entertainment. Mr. Bond is reputed to be the wealthiest colored citizen of this country, a cotton trader, farm owner, stock raiser and among other things, a sand and gravel producer. His object in attending the convention, he stated, was to find a partner for his gravel business, an active partner, who did not need to invest, as the proprietor had all the money needed and some to spare.

Mr. Bond does not read nor write and

Annual Convention of the National Association of San
February 13,

is absolutely unfamiliar with the sand and gravel business, yet he has built up a lucrative trade in this commodity, as in all others he has traded in. He claims to have the only gravel deposit for miles around; has already done considerable ballast business with the Rock Island Lines and has a big future in highway work. Altogether, Mr. Bond furnished the convention with one of its star features.

CHICAGO will soon be the headquarters of the National Association. And it was not chosen by Chicago producers, either. J. H. Allen, of Lincoln, Neb., is the man who brought the matter to a head by having the resolution made to read "Chicago" instead of "some other city than Indianapolis." Chicago was named by Mr. Allen because it is the commercial center of the country, the center of many railway systems and the headquarters of several national associations, with which it is proposed to co-operate.

Quality Tests of Sand and Gravel

SINCE THE NEW Indiana State Highway specifications make reference to a QUALITY test for coarse gravel aggregate, it is timely that the following information be presented for your consideration. The present quality test exercised by the Bureau of Public Roads at Washington is best described by Mr. Hubbard, formerly in that office, and is quoted as follows:

Quality of Gravel Pebbles

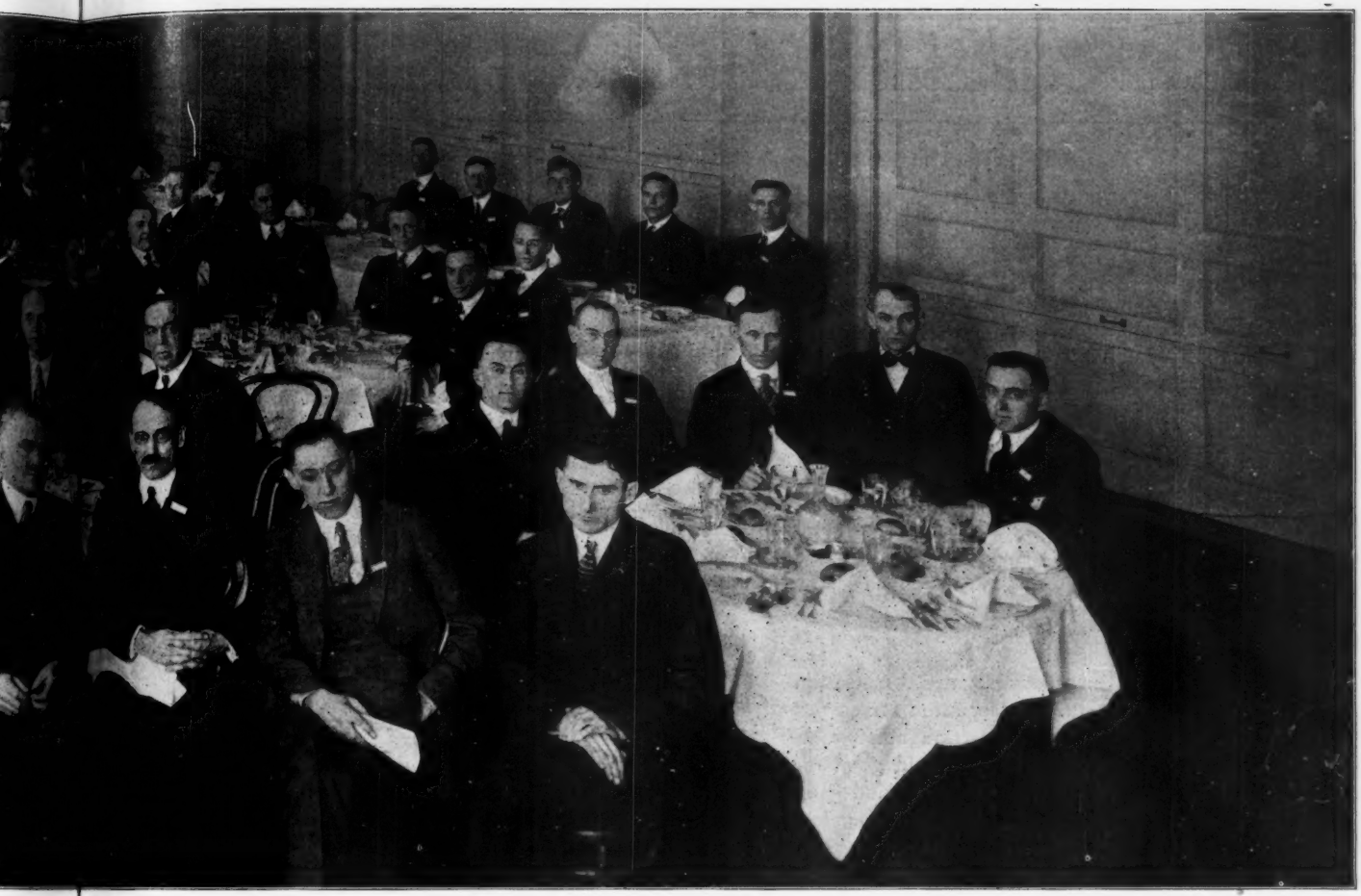
"A rough determination of the quality of pebbles, in a gravel product, may be made by sorting out and discarding from the total material retained on the one-fourth-inch screen in the mechanical analysis determination, all pebbles which are manifestly soft, decomposed or partly disintegrated. A geologist's hammer is then conveniently used in testing out the apparently sound pebbles. Those which are readily broken or, when broken, are found to be composed of inferior sandstone should also be discarded. The remaining pebbles and fragments which are considered of good quality should then be weighed. The difference between this weight and that of the total material retained on the one-fourth-inch screen gives the weight of inferior material, which should be calculated upon a percentage basis of the total weight."

The accuracy of the above test depends upon the skill and experience of the operator, which is not a standard quantity.

The test for crushed rock known as the Deval Abrasion Test is described in U. S. B. P. R. Bulletin No. 370:

Deval Abrasion Test

"A test devised by the French for



n of Sand and Gravel Producers at Luncheon in Chicago, uary 13, 1920

measuring the combined action of abrasion and impact is as follows: Five kilograms (11 pounds) of *freshly broken rock* between two and two and one-half inches in size is tested in a special form of cylinder so mounted on a frame that the axis of rotation of the cylinder is inclined at an angle of thirty degrees, with the axis of the cylinder itself. The fragments of rock forming the charge are thus thrown from end to end twice during each revolution, causing them to strike and rub against each other and the sides of the cylinder. After 10,000 revolutions, the resulting material is screened through a one-sixteenth-inch sieve and the weight of the material passing is used to calculate the percent of wear. The French coefficient of wear is calculated as follows:

$$\text{French coefficient of wear} = \frac{40}{\text{Per Cent Wear}}$$

The above has long been the standard method of test of crushed rock for macadam roads. When gravel is tested in the same machine, the loss by abrasion is very small, due to the roundness of the particles, and proper discrimination between good and bad gravel is not developed in this test.

Ohio Modification of Deval Test

Prof. Rea of the Ohio State Highway Commission has modified the Deval test for gravel by adding six cast iron spheres 1.875 in. in diameter, and weighing approximately .95 lbs. each, to the charge in the cylinder. The cast iron shot increases the severity of the test, causing about the same loss in weight by abrasion on rounded particles as is caused by the Deval abrasion on angular particles of the same quality. The gravel sample is divided into two parts: 5½ lbs. between 2 in. and 1 in., and 5½ lbs. between 1 in. and ½ in. This test seems to approximate the Deval test for the better grades of material. For stones and gravel giving a French coefficient below seven, the results vary greatly, sandstone samples or gravel running very high in per cent of loss.

Another abrasion testing apparatus which is receiving much attention is the modification of the Deval machine by Scofield, formerly of Purdue University. It is a small type of rattler, octagonal in shape, with volume equivalent to the Deval cylinder, but with 1/16-in. openings between staves, which allow dust to escape. The same size sample and abrasion charge as for the Rea test is used. Freshly broken stone is given 2,000 revolutions at 30 R.P.M., gravel 4,000 at the same rate. Several tests and comparisons have been made, but sufficient work has not been done to warrant the adoption of any of the methods discussed without allowing very broad limits. There appears to be a variable relation between strength of concrete and abrasive resistance of the coarse aggregate entering into it.—Indiana Sand and Gravel Association "News Letter."

Random Comments on the Issues of the Day

Lime in Chemistry

Great strides have been made recently in the use of lime in the manufacture of insecticides. This is particularly true in the widespread substitution of lime for lead in the production of arsenates.

Calcium arsenate, made from lime, is finding a rapidly increasing field of usefulness, its latest being for destruction of the boll weevil in the Southern cotton country.

Its use in place of arsenate of lead was due to the rapidly mounting cost of lead and the search for a cheaper substitute. This is the reason why lime has found such a wide variety of uses in the chemical industries. It is the cheapest active alkali to be had and there is little doubt but that many new uses will be found for it in supplanting more costly chemicals now in use.

Seasonal Prices

Both the Wisconsin Mineral Aggregates Association and the Illinois Sand and Gravel Association secretaries have warned members against quoting prices which will hold good for longer than a specified period—and a short period is recommended. Much is to be said on both sides of this question. The Birmingham Slag Co., Birmingham, Ala., C. E. Ireland, Sales Manager, takes a diametrically opposite view. His argument follows:

We have guaranteed prices for the full year of 1920, as this, in our judgment, is a policy that not only the Rock Products industries should establish at the earliest possible date, but also all other producers of road building and general materials, in order that the enormous amount of building in prospect can be carried out in an economical manner. We believe that the stabilization of prices on building materials is very essential at this time, even though it is difficult and more or less of a gamble on the part of the producers to guarantee prices for any long period of time in the future under the abnormal conditions still existing.

For instance, a contractor bids upon a job on which he cannot procure guaranteed quotations on his different building materials, and necessarily is obliged to protect himself by estimating the percentage of increase that he will likely be obliged to pay for the different materials before his job is completed in case he is awarded the contract. At the best this is always a rank guess and by the time he tacks on to his bid, based on present prices, a 10, 25 or even 50 per cent increase, it naturally throws his bid at an enormous figure, and has already been the cause of a great number of Federal Aid road jobs, as well as considerable building construction, being postponed and bids rejected, because lowest bid being far beyond the available funds for such project.

There is a serious danger of a reaction and a refusal on the part of the Bureau of Public Roads and State Highway Departments to proceed with their big highway construction program, unless something is done to stabilize prices, thereby making it unnecessary for the contractor to simply guess at the cost of his materials when bidding upon different jobs.

We sincerely believe that if the producers of mineral aggregates and other building materials, especially cement (which we are told is now quoted in only one car lots, with absolutely no assurance to the contractor what he will be obliged to pay for his cement to complete his job, whether it be a paving or building job) establish a schedule of prices for a period of three, six or twelve months, that much more construction work will be done, more miles of permanent roads be constructed, and at less cost, and at the same time all concerned can do business at a profit. It is much better that the producers figure out the schedule of prices, even if they have to increase the present schedule in anticipation of increased costs, due to probable increased labor costs or car shortage, and then protect a contractor for his full requirements on a certain job, or at least for all shipments made during a certain period of months, so as to eliminate the uncertainty and the gamble that the contractor must take under existing conditions, which, as I said before, must be reflected in his bid on a job.

That Mr. Ireland's point is very well taken was evident from listening to the discussions at the recent convention of the Associated General Contractors of America at Chicago. There are three great big gambling elements in this year's work—car supply, labor and material supply. It is obvious that to remove all of these gambling elements would tremendously improve the prospects of getting some of the prospective work done; to remove one is certainly a step in the right direction and a far-sighted move on the part of the producer for purely selfish reasons, let alone patriotic motives.

Director Bennett of the Illinois State Department of Public Works made it plain to the contractors that the whole 1920 state road program was in jeopardy for just this reason. Bids for this year's work, he said, were 50 per cent higher than for work done last year. He did not say he was not willing to pay this if it really represented increased cost, but he did infer that he was not going to pay that much increase if it merely represented a gambling margin.

Mr. Ireland, of the Birmingham Slag Co., admits that he is taking a big chance; that if car service is no better than last year he will be about ruined. His policy is not a matter of snap judgment. He and his associates are some of the most experienced crushed-stone quarry men in this country. He had to convince his associates that he was right. He did this largely by submitting to them three sets of price schedules, one with three months' limitation, one with six months' and the one guaranteeing prices for the whole year. Each successive one had added to it a little more margin for profit and contingencies. The yearly price was selected as the proper policy under the present extraordinary conditions.

Relation of Human Element to Accident Prevention

By H. G. Jacobsen

Portland Cement Association, Chicago, Ill.

RELIANCE for prevention of accidents must ultimately be placed upon the individual worker himself.

The human element is by far the most important factor to be considered in accident prevention work. By human element is meant that inherent tendency of men to be careless, negligent or reckless in respect to their own safety and that of their fellow workmen. This is a tendency not only of the laborer but of all human beings working or traveling anywhere. That education and training of executives as well as workers is essential to any material improvement in accident prevention is beyond question.

The human element is without doubt responsible for more than 75 per cent of all accidents in any industry. In attempting to find a remedy for this condition, the question arises: Is the class of labor employed responsible for this condition? There is no reason to believe that this is so to any appreciable extent. It is true that men of higher intelligence can be expected to do better work, but it does not always follow that they are more careful than men of less intelligence or education. An assistant superintendent at a cement plant who had worked there for many years was recently killed in an accident because he did something which, if he had considered his own safety in connection with it, he would have pronounced gross carelessness. He neglected to consider this and paid the penalty. When workmen in the lower grades are injured it is as often on account of ignorance of danger as of carelessness.

The human element is our most important problem and at the same time one which has been given least thought because it is the most difficult. This brings up the question of the relation of personnel work, in the broader sense, to accident prevention. The matter of safeguarding physical hazards is very important and all guards can be applied by those who are willing to make their plants physically safe. But the human element can only be improved by personnel work.

In attempting to start accident prevention work it should be remembered that men like to do things on their own initiative rather than to do them because they are told. A safety committee properly organized and managed will develop the initiative of the men. It is not true, as might at first be supposed, that the men will propose all sorts of foolish ideas and run you into enormous expense. The statement made by a cement plant superintendent a short time ago describes what is really the correct condition. He said: "It is surprising how few bad recommendations they bring. The men who work right where the accidents occur can bring in some of the best recommendations you ever heard of. Most of them are simple and it does not cost much money to comply with them."

Through discussion in safety committee meetings of accidents and unsafe practices brought to light at their own and other plants, the men can prevent the 75 per cent of accidents, traceable as previously stated to the human element. At the same time they will appreciate the value placed on their co-operation and take greater interest in the general activities at the plant.

Accident elimination does not come of itself. It is necessary to give real thought to the problem and thereafter, hard work. It is difficult work and many disappointments are met with, nevertheless it is work in which there is ample remuneration in the form of actual saving in money and the better feeling created among the employes.

The plant which has not yet considered the human element in accident prevention, except in a superficial way, has not entered upon the proposition in the right manner. It is inconsistent to think that employes can be taught the habit of safety when they come in daily contact with indifference on the part of their superiors. The management determines the location, output and character of a plant. The management's own responsibility must first be discharged in order that an atmosphere may be created, out of which the employes can absorb the principles and ideas of safe practices. The management must take the lead in safety work in such a manner that the employes will feel that it is more than a mere side issue taken up in a moment of enthusiasm, soon to be forgotten. Keep it up!

An interested employe will think about his work and will in time become a safe worker. It is the distracted man, the so-called "star gazer," whose mind is elsewhere than on his work and safety, who is the unsafe worker.—From the "Accident Prevention Bulletin," Portland Cement Association.

Five Dollars per Capita

FIVE DOLLARS PER CAPITA or five hundred million dollars, is the sum paid for personal injuries received in accidents in the United States in one year. This figure does not include any of the costs inherent in all accidents—damaged equipment—decreased production.

Each year the accident score totals hundreds of thousands of men, women and children killed or seriously injured; and each year the cost of these accidents totals hundreds of millions of dollars—the burden of which is borne almost entirely by the industries of the country.

It has been demonstrated that 75% of these accidents could have been prevented, that 75% of this great sum could have been saved. This fact is of vital importance to every industrial organization in America.

The great problem of saving this wastage has called into being the National Safety Council—a co-operative, non-commercial association of almost four thousand of the leading industrial concerns in the United States—and the only organization in existence which has demonstrated that it can deliver a service which will help you to effect this 75% reduction.

A letter to the Business Division of the Council, requesting an outline of its service, will receive a prompt response.

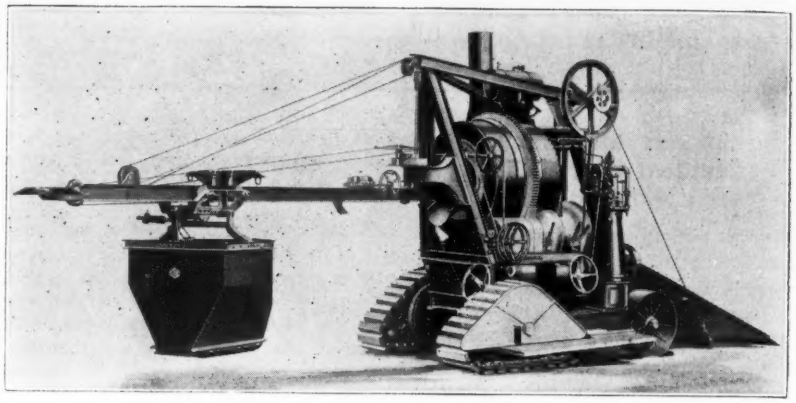
NATIONAL SAFETY COUNCIL
Co-operative Non-commercial

NEW MACHINERY AND EQUIPMENT

New Concrete Mixer

THE ILLUSTRATION on the right shows a new paving mixer put on the market by the T. L. Smith Co., Chicago, Ill. The new mixer is entirely gear driven with the single exception of the chain running from the drive shaft to the wheels. There are 11 gears in all.

Simplicity and durability are the principal features claimed for the new mixer. Steel castings have been used in many cases where the usual iron casting might have sufficed under ordinary conditions. The frame is made of tough steel channels heavily reinforced and all of its strength possesses surprisingly light weight.



New "Simplex" Smith concrete-paving mixer

New Radial Type of Loader

THE THREE-WHEEL construction of the new radial loader, made by the Jeffrey Manufacturing Co., Columbus, Ohio, enables it to move backward and forward along straight lines into a pile of material or to cut wide swaths across the face of a pile by swinging alternately upon its driving wheels as pivots, which action is obtained through the use in its driving unit of a set of differential gears, the same as in an automobile, whereby the driving wheels act in conjunction with or independently of each other.

As noted in the accompanying view, by turning the steering wheel at quite an acute angle to the driving wheels, the discharge chute will remain practically stationary at the center of the circle, while the pick-up end of the extending elevator boom will travel in a circular path or by alternately reversing the propelling drive, the loader will oscillate back and forth in an arc. If the steering wheel is gradually turned through a few degrees either way from the above circular path, the whole machine, while cutting from right to left in an arc, will gradually move forward into the pile, allowing full range of the machine. This illustration also shows the small radius in which the loader will operate.

The radial loader is designed to handle heavy materials, such as crushed stone, sand, gravel, coal, etc. The large wheels enable it to pass over soft, rough or uneven ground, and it will rigidly maintain its equilibrium under all conditions of ordinary rough storage ground or floor. The quickly adjustable loading boom makes the loader an ideal clean-up machine on both smooth and rough ground, it is claimed.

The capacity of the loader is 1 cu. yd. per minute. It is claimed to load crushed stone maximum size pieces through 2½-in. ring—maximum size coal 6-in. lumps.

New radial wagon loader, made by Jeffrey Manufacturing Co.

Iowa Sand and Gravel Men Hold Annual Meeting

Join National Association as a Body and Adopt Aggressive Policies

THE IOWA SAND AND GRAVEL PRODUCERS ASSOCIATION met in annual convention at Des Moines, February 4 and 5. R. C. Fletcher, president, acted as chairman and C. V. Ray, as secretary. It was unanimously voted to join the National Association of Sand and Gravel Producers as a body. The Iowa association has started the year with 27 members.

The Iowa association already had a specifications committee working with the State Highway Department on specifications for sand and gravel and a transportation committee. At the February meeting a committee of one, R. Snoddy, Coon River Sand Co., was appointed to draft a standard form for making quotations.

"Transportation and Railway Conditions" was the subject of an address by Dwight Lewis, chairman of the Iowa State Railway Commission. Some interesting discussions followed, which showed that some producers are already equipped to supply detail information as to railway revenue from sand and gravel traffic. A committee was appointed which drafted resolutions to the Iowa senators and congressmen urging the passage of the railway bill.

A budget system was adopted and a total expenditure in 1920 of $3,000 was provided for. The following officers for 1920 were unanimously elected:

President, R. C. Fletcher, of the Flint Crushed Gravel Co., Des Moines; vice-president, G. H. Boynton, of the Northern Gravel Co., of Muscatine; secretary and treasurer, Gaylord Gray, of the Des Moines Sand & Fuel Co., Des Moines; chairman, Transportation Committee, H. D. Bellamy, of the Iowa Sand & Gravel Co., Oskaloosa; chairman, Specifications Committee, G. H. Boynton, of the Northern Gravel Co., Muscatine; chairman, Membership Committee, E. H. Lowderbaugh, of the Lake View Sand & Gravel Co., Lake View.

Cost of Operating a County Gravel Plant

A SAND AND GRAVEL WASHING PLANT of 200 cu. yd. capacity per day, operated by Wayne County, Michigan, is receiving considerable publicity. The pit is operated by horse-drawn scrapers. The plant is said to have cost $7,200 "to erect," which presumably includes the cost of the equipment, etc.

The "cost of operation" is given as follows:

4 teams, at	$8.00	$32.00
2 scraper holders, at	5.00	10.00
1 foreman, at	6.50	6.50
1 operator, at	6.00	6.00
2 car loaders, at	5.00	10.00
Motor rental, at	1.50	1.50
Electric current, est.		10.00
Total daily expense		$76.00

Including a royalty of 15c. per cu. yd. the "cost of operation" is stated to be 53c. per cu. yd., f.o.b. the plant.

It will be noted that the cost figures given are based on a *daily cost for maximum production* and do not include one cent for overhead, depreciation, cost of stripping and opening the pit, industrial insurance, etc. Yet *these* figures are being widely circulated to show the great economy of such plants. Why just the item of industrial insurance alone will add nearly 2c. per cu. yd. to the estimated total! To the figures given should be added something for superintendence, as the plant certainly does not run itself. There should be a charge for knocking down and moving the plant to a new location, and a dozen other legitimate items which enter, not necessarily in the daily cost, but in the year's or season's operation.

Yet this is the kind of cost data the man who is trying to operate a sand and gravel plant at a profit is constantly confronted with. Can you beat it?

Joint Convention of Concrete and Cement Promoters

THE American Concrete Institute, the National Conference on Concrete House Construction, and the Concrete Products Association held an annual joint convention in Chicago, Ill., February 17 to 19, inclusive. The convention was of interest to the aggregate producers and manufacturers of cement in that its prime object was to promote and develop the uses of concrete and cement.

Aside from the elaborate program prepared for the three days' session, a large room was utilized to present the most modern and attractive designs of concrete products, such as floor and roof tile, garden and porch furniture and concrete buildings of the industrial, factory and residence classes.

Real Cause of Chronic Open-Top Car Shortage

FLUCTUATION IN COAL PRODUCTION is a subject of vital interest to every industry using coal, but it is of even more vital interest to the mineral aggregate industries which have to compete with the coal miners for open-top cars and for labor. The following is an abstract of an authoritative contribution on the subject by George Otis Smith, director, and F. G. Tryon of the U. S. Geological Survey:

Mines Idle 93 Days Every Year

"The 'bad load factor' of the soft coal mines of the country shows itself in the annual, seasonal and daily fluctuations in coal production. On the average during the past thirty years the mines have been idle 93 working days in the year. General business conditions cause annual fluctuations of about 15 days in the lost time of the mines, but the remaining 78 days are lost because of fluctuations in car and labor supply, but mostly the summer slump in demand. At best, the difference between winter and summer buying of coal makes inevitable a period in which the capital and labor engaged in coal mining cannot work more than 30 hours out of the 48 hours. The 30-hour week is the spring ailment of the bituminous coal industry, not its cure.

"These statements of lost time are weighted averages for the whole country, the irregularities in opportunity to work are less in some favored districts and far greater in the central competitive field and the individual miner is affected more by local fluctuations than by any average for the United States. It is significant that there is a rough relation between the loss of working time and the degree of unionization. The operator also loses by the idle days of his mine and in the end the consumer pays the bill.

"The loss to the railroad from seasonal fluctuations in coal mining is large, the investment in coal cars is of the same order of magnitude as the investment in coal mines and coal makes up one-third of the freight tonnage. Improving the load factor of both mines and railroads means encouraging summer buying of coal, and for this seasonal discounts in price and in freight rates have been suggested, and the basal problem is coal storage.

Excess Mine and Labor Capacity

"The national interest in bettering the load factor of the soft coal industry is measured by the fact that we have an excess mine capacity of at least 150 million tons and an excess labor force of perhaps 150,000 men. In terms of man-days, universal military training of our young men for three months would cost the nation less than the present enforced idleness in coal mining."

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.			From stock, 1.50 per net ton, all sizes			
Burlington, Vt.	1.00	.....	2.50	2.00	2.00	.....
Chaumont, N. Y.	.....	**1.75**	**1.65**	**1.35**	**1.25**	**1.25**
Coldwater, N. Y.			Flux, 1.50@2.10			
Limekiln, Md.	1.25	2.10	2.00	1.75	1.40	1.25
North Leroy and Akron, N. Y.	1.00	1.00	1.00	1.00	1.00	1.00‖
Pittsburgh, Pa.	1.25	1.40	1.50	1.50	1.50	1.50
CENTRAL:						
Alden, Ia.	.70	.70	1.35	1.35	1.35	1.35
Alton, Ill.	2.00	2.50	1.50	1.50	1.50	.....
Bettendorf, Ia.			1.50 per cu. yd., all sizes			
Buffalo, Ia.	.....	.....	1.60	1.50	1.50	.....
Chicago, Ill.	1.25	2.00	1.65	1.50	1.50	1.50
Cincinnati, Ohio	.....	2.00	2.00	2.00	.....	.....
Cleveland, Ohio	.....	2.40	2.20	2.20	.....	.....
Davenport, Ia.	1.50•	1.50•	1.50•	1.50•	.....	.....
Detroit, Mich.	.....	2.40	1.70	1.60	.....	.....
Dundas, Ont.	.65	1.20	1.20	1.20	1.00	1.00
Eden and Knowles, Wis.	1.00@1.10	1.10@1.20	1.10@1.20	1.10@1.20	1.10@1.20	.....
Elmhurst, Ill.	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25
Ft. Wayne, Ind.	1.60	1.90	1.90	1.80	1.60	1.60
Greencastle, Ind.	1.50	1.25	1.10	1.00	1.00	1.00
Hull, Canada	2.50	2.30	2.50	2.10	2.00	1.75
Illinois, Southern	2.00	1.50	1.50	1.50	1.50	.....
Krause, or Columbia, Ill.	1.80	1.30	1.50	1.40	1.30	1.30
Laumon, Wis.	1.25	1.25	1.25	1.25	1.25	1.25
Lima, Ohio	1.40	1.40	1.40	1.40	1.40	1.40
Mansfield, Ohio	1.70	2.20	2.00	1.90	1.70	1.70
Montrose, Ia.	1.25	1.15@1.25	1.15@1.25	1.10@1.25	1.10@1.15	.....
Oshkosh, Wis.			1.40 per ton, all sizes			
River Rouge, Mich.	.....	1.50	1.50	1.50	1.50	1.50
St. Louis, Mo.	.60	1.60	.....	.....	.....	.....
Stone City, Ia.	.80	.....	1.60	1.50	1.40	.....
Toledo, Ohio, f. o. b. cars	1.60	2.10	1.90	1.80	1.60	1.60
Toronto, Canada	1.55	2.25	2.25	2.25	2.05	2.00
SOUTHERN:			These prices include 90c freight			
Brooksville, Fla.	1.00	.....	.....	2.25	2.25	.....
Cartersville, Ga.	.....	2.25	2.10	2.00	.....	1.90
Chickamauga, Tenn.	1.50	1.75	1.75	1.75	1.75	1.75
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	1.00
Mascot, Tenn.	.....	1.50	1.50@1.75	1.50@1.75	1.50@1.75	.....
Memphis Jct., Ky.			1.10@1.35, all sizes			
New Braunfels, Tex.	.60	1.75	1.65	1.50	1.50	1.50
Winnfield, La.	.80	2.50	.....	2.00	2.00	.....
WESTERN:						
Atchison, Kans.	.50	2.00	2.00	2.00	1.90	1.90
Blue Springs and Wymore, Neb.	.20	1.75	1.75	1.65	1.55	1.50
Kansas City, Mo.	.60	2.00	.....	.....	.....	.....

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	.....	.90	2.75	2.50	2.00	1.75
Bernardsville, N. J.	.....	2.80	2.60	2.20	.....	.....
Bound Brook, N. J.	1.00@1.25	2.00@2.25	1.80@1.90	1.60@1.80	1.50@1.70	.....
Branford, Conn.	.80	1.50	1.50	1.20	1.10	.....
Birdsboro, Pa.	1.40	1.90	1.80	1.60	1.40	1.40
Castro Pt., Richmond, Cal.	.50•	.....	1.50•	1 50•	1.40•	.....
Dresser Jct., Wis.	.75	2.25	2.25	2.00	1.70	.....
Duluth, Minn.	.75	1.75	1.50	1.15	1.15	.....
E. Summit, N. J.			(2.75@2.85, all sizes)			
Glen Mills, Pa.	1.00	1.35	1.70	1.55	1.35	1.35‖
Millington, N. J.	1.80	1.80	1.80	1.60	1.00	.....
New Britain, Conn.	.80	1.30	1.25	1.20	1.00	.....
Westfield, Mass.	.60	1.20	1.10	1.00	.90	.80

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Dundas, Ont.—Flint	1.10	1.10	1.10	1.10	1.10	1.10
Little Falls, N. Y.—Syenite	.80	1.20	1.40	1.20	1.20	1.20‖
Mayville, Wis.	.90@1.00	1.10@1.25	1.10@1.25	1.10@1.25	1.10@1.25	1.10@1.25
Middlebrook, Mo.—Granite	3.50	.....	1.75	1.75	.....	1.00‡
Portland, Maine—Granite	1.50	.....	.....	1.35	1.25	.....
Roseburg, Ore.	.....	1.50	1.25	1.05	1.00	1.00
Stockbridge, Ga.—Granite	.50	2.00	1.90	1.75	1.75	.....
White Haven, Pa.—Sandstone	.85	1.20	1.40	1.20	1.20	1.20‖
Granite	1.25	.....	1.50	1.50	1.50	.....

•Cubic yard. †Agrl. lime. ‖R. R. ballast. §Flux. ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Coldwater, N. Y.—Analysis, 56.77% $CaCo_3$, 41.74% $MgCo_3$—80% thru 100 mesh; bulk	3.00
Ppr.	4.50
Chaumont, N. Y.—Analysis: $CaCo_3$, 92 to 98%; $MgCo_3$, 1.51%—(Thru 100 mesh); ppr., 4.00; bulk	2.50
Paper bags	4.00
Grove City, Pa.—Analysis: $CaCo_3$, 94.75%; $MgCo_3$, 1.20%—(70% thru 100 mesh); 80 lb. ppr., 4.60; bulk	3.25
Grove, Md.—90% thru 4 mesh; bulk	3.00
Hillsville, Pa.—Analysis, $CaCo_3$, 96% (90% thru 100 mesh); bulk	2.75
Sacks	4.50
Jamesville, N. Y.—68% thru 100 mesh; 95% thru 50; 100% thru 20. Sacks, 3.75; bulk	2.25
Walford, Pa.—(70% thru 100 mesh; 85% thru 50; 50% thru 50; 100% thru 4); sacked, 4.25; bulk	2.75
West Stockbridge, Mass.—Analysis: Combined carbonate, 95%—33% thru 200 mesh; 66% thru 100; 100% thru 40. Bulk	2.85
Williamsport, Pa.—Analysis, $CaCo_3$, 88-90%; $MgCo_3$, 3-4%—(50% thru 50 mesh); bulk	3.00
Bags	4.50
CENTRAL:	
Alton, Ill.—Analysis: $CaCo_3$, 96%; $MgCo_3$, 0.75%—50% thru 4 mesh	2.50
Bedford, Ind.—(90% thru 10 mesh) Analysis, $CaCo_3$, 98.5%; $MgCo_3$, 0.5%	1.75
Belleville, Ont.—Analysis, $CaCo_3$, 90.9%; $MgCo_3$, 1.15% (45 to 50% thru 100 mesh; 61 to 70% thru 50 mesh); bulk	2.50
Chicago, Ill.—Analysis, $CaCo_3$, 53.63%; $MgCo_3$, 37.51%—90% thru 50 mesh	1.00
Columbia, Ill., near East St. Louis (⅛" down)	1.25@1.80
Ellettsville, Ind.—Analysis, Carbonate, 98%	2.00
Elmhurst, Ill. — (Analysis, $CaCo_3$, 35.73%; $MgCo_3$, 20.69%) 50% thru 50 mesh	1.25
Greencastle, Ind.—(Analysis, $CaCo_3$, 98%) 50% thru 50 mesh	1.75
Howenstein, O.—100% thru 10 mesh; 59% thru 50; 39% thru 100	2.75@3.00
Kansas City—(50% thru 50 mesh)	2.00
Lannon, Wis.—(90% thru 50 mesh) Analysis, 54%, $CaCo_3$; 44%, $MgCo_3$	2.00
Marble Cliff, O.—(50% thru 100 mesh) Analysis, $CaCo_3$, 86%; $MgCo_3$, 8%	2.50
Marblehead, O. — (Analysis: $CaCo_3$, 95.33%) 100% thru 100 mesh, sacks, 4.75; bulk	2.75
McCook, Ill.—Analysis, $CaCo_3$, 54.10%; $MgCo_3$, 45.04% — 100% thru ¼" sieve; 78.12% thru No 10; 53.29% thru No. 20; 38.14% thru No. 30; 26.04% thru No. 50; 16.27% thru 100	.90@1 00
Milltown, Ind.—Analysis, $CaCo_3$, 94%; $MgCo_3$, 3%—(100% thru 4 mesh)	1.50
Montrose, Ia.—(90% thru 100 mesh)	1,25
Muskegon, Mich.—(90% thru 50 mesh) Analysis, $CaCo_3$, 53.35%; $MgCo_3$, 43.27%	2.50
Piqua, O.—Analysis: $CaCo_3$, 82.8%; $MgCo_3$, 8.2%; neutralizing power in terms of calcium carbonate, 95.3%—70% thru 100 mesh; bulk	2.75@4.50
Stolle, Ill. (near East St. Louis on I. C. R. R.)—(Thru ⅛" mesh) Analysis, $CaCo_3$, 89.61 to 89.91%; $MgCo_3$, 3.82%	2.00
St. Paul, Ind.—Analysis, $CaCo_3$, 85%; $MgCo_3$, 12%	1.50
Stone City, Ia.—Analysis, $CaCo_3$, 98% (50% thru 100 mesh)	.80

Agricultural Limestone

Toledo, O.—Analysis, $CaCo_3$, 52.72%; $MgCo_3$, 43%—(20% thru 100 mesh); 30% thru 50; 80% thru 100; 100% thru 5/32 screen)	1.80

(Continued on next page.)

(Continued from preceding page.)

Whitehill, Ill.—Analysis, $CaCo_3$, 96.12%; $MgCo_3$, 2.50%—
90% thru 50 mesh, bulk 2.00
90% thru 100 mesh 5.00

SOUTHERN:

Cartersville, Ga.—Analysis: 96 to 98% combined carbonates—All thru 10 mesh with all dust in 2.50
Claremont, Va. (Marlime)—Analysis, 90.94% $CaCo_3$, 0.31% P., 1.36% Mg., 0.37% K.; bulk 4.50
100 lb. ppr. bags 6.00
100 lb. cloth bags 6.50
Dittlinger, Tex.—Analysis, $CaCo_3$, 99.09%; $MgCo_3$, .04%.
90% thru 100 mesh 2.00
90% thru 4 mesh 1.00
Grovania, Ga.—Analysis, $CaCo_3$, 95%; $MgCo_3$, none—50% thru 100 mesh 2.50
Hopkinsville, Ky.—Analysis, 94.6 to 98.1% $CaCo_3$—Bulk 2.00
Marion, Ga.—Analysis, 90% $CaCo_3$—(50% thru 100 mesh) 2.00
Memphis Jct., Ky.—(Analysis, $CaCo_3$, 95.31%; $MgCo_3$, 1.12%); average price, ¼ in. down 2.00
Mascot, Tenn.—Analysis, $CaCo_3$, 52%; $MgCo_3$, 38%.
(80% thru 100 mesh) 2.75
(All thru 10 mesh) 2.25
(80% thru 200 mesh) 4.00
Paper bags, $1.50 extra per ton; burlap, 2.00 extra per ton.
Maxwell, Va. 2.50
Mountville, Va.—Analysis, $CaCo_3$, 76.6%; $MgCo_3$, 22.8%—100% thru 20 mesh; bulk 4.75
100 lb. ppr sacks 5.75
Ocala, Fla.—Analysis, $CaCo_3$, 98%—(75% thru 200 mesh) 4.50
Tyrone, Ky.—Analysis, $CaCo_3$, 93%; $MgCo_3$, 6%—90% thru 4 mesh 2.25
Winnfield, La.—(50% thru 50 mesh) 3.00

WESTERN:

Cement, Calif.—50% thru 50 mesh 4.00
Colton, Calif.—Analysis: $CaCo_3$, 95%; $MgCo_3$, 1½%; bulk, 2.50; bags 3.50
Sacks, 15c extra, returnable.
Kansas City, Mo., Corrigan Sid'g—50% thru 50 mesh; bulk 1.35
Terminous, Calif.—Analysis, 94% $CaCo_3$, 1.4% $MgCo_3$—(60% thru 200 mesh; 90% thru 100 mesh; 100% thru 40 mesh); bulk 4.00
Sacked 4.50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened, unless otherwise stated.

GLASS SAND:

Berkeley Springs, W. Va. ..... 2.25@2.75
Special hand selected rock **2.50**
Bridgeton, N. J. **2.00**
Cedarville and South Vineland, N. J.—
Glass, damp **2.00**
Glass, dry **2.50**
Gray Summit, Mo. ..... 2.00@2.50
Guion, Ark.—Carlots **2.00**
Klondike and Pacific, Mo.:
Contracts 2.00
Carlots **3.00**
Mapleton, Pa. 2.50
Glass, damp 2.00
Massillon, Ohio 3.00
Michigan City, Ind.— ..... .30@ .40
Millington, Ill.—Contracts 2.00
Mineral Ridge, O. 2.75
Montoursville, Pa.—Green, washed 1.50
Oregon, Ill.—Large contracts 1.75
Open market 2.50
Ottawa, Ill. ..... 1.75@2.50
Robinson, Md., washed, screened, not dried 2.00
St. Marys, Pa.—Green 2.50
Sands, Elk Co., Pa.—Selected, green 2.75
Thayer, W. Va.—Washed 2.50
Unwashed 2.00
Utica, Ill. ..... 1.75@2.50

FOUNDRY SAND:

Albany, N. Y.—Core ..... 1.50@2.50
Furnace lining ..... 2.25@2.75
Molding coarse, fine 2.50
Brass molding 2.50
Sand blast ..... 2.75@4.00
Allentown, Pa.—Core ..... 1.50@1.75
Molding coarse 1.50
Arenzville, Ill.—Molding fine ..... 1.50@1.75
Beach City, Ohio—Core 2.00
Green silica sand (not dried) 2.00
Washed silica sand (not dried) 2.25
Bowmantown, Pa.—Core 1.25
Furnace lining 2.50
Molding, fine and coarse 1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge, South Heights, Pa.		1.00		1.00	.80	.80
Attica, N. Y.	.65	.65	.65	.75	.75	.75
Concord Jct., Mass.	1.00	1.00	1.25	1.25	1.25	1.25
Farmingdale, N. J.		.75				1.50
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Ludlow, Mass.		60*	1.25		1.10	
Morristown, N. J.	.60	.60	1.20	1.00	1.00	
Portland, Me.	.50	1.50		1.35	1.25	
Washington, D. C. (F. O. B. wharves on cars)	.75	.75	2.00	1.40	1.20	1.20
Yardsville, N. J.			.50@ .75, all sizes			
CENTRAL:						
Alton, Ill.	.60@ .75	.60@ .75	1.50@4.50	1.30	1.20	1.20
Anson, Wis.		.60@ .75		1.25@1.50		.90@1.25
Barton, Wis.	.85	.80	1.00	.80	.80	.80
Beloit, Wis.			.50 sand, .70 gravel			
Chicago, Ill.		1.30@1.40	1.30@1.50			
Columbus, Ohio		.70@1.00	.70@1.00	1.00	.70@1.00	.70@1.00
Covington, Ind.	.75	.75	.85	.75	.75	.75
Des Moines, Ia.	.75@1.00	.75	1.65	1.65	1.50	1.50
Earlestead (near Flint), Mich.	.60	.60				.70
Eau Claire, Wis.					1.10	
Elgin, Ill.		.80	1.00	.80	.80	.80
Ft. Dodge, Ia.	1.35	1.25	2.15			2.05
Ft. Jefferson, Mechanicsb'g, O.	.50@ .60	.50@ .60	.50@ .60	.60@ .70	.60@ .70	.60@ .70
Grand Rapids, Mich.	.50	.60	1.00	.90	.80	.80
Grass, Mich.		1.00	1.60	1.20	1.20	1.20
Indianapolis, Ind.	.60	.60		1.50	.75	.75
Mason City, Ia.	.85	.75	1.65	1.60	1.50	1.40
Milwaukee, Wis.	1.25	1.25	1.35	1.35	1.35	1.35
Minneapolis, Minn.	.50	.50	1.75	1.75	1.50	1.50
Oxford, Mich.			(60-40 mix, .85 per ton)			
St. Louis, Mo., F. O. B. cars	2.20@2.25		2.50	2.30	2.30	2.25
Terre Haute, Ind.	.75	.75		.85	.75	.75
Yorkville, Moronts, Oregon and Ottawa, Ill.	.70	.70	.80	.80	.80	.80
SOUTHERN:						
Alexandria, La.		.80				1.50@1.75
Arkansas City, Ark.		.75				
Knoxville, Tenn.	1.15	1.15	1.50	1.50	1.50	1.40
Lake Weir, Fla.		.60				
Lincoln, Neb.	.90	.90	2.20	2.20		
Macon, Ga.		.75				
N. Martinsville, W. Va.		1.10@1.20				
Pelzer, S. C.	.70	.70				
Roseland, La., and Condron, Miss.		.35			1.25	
Thomas, La.	.60					1.75
Tulsa, Okla.		.70				
Valde Rouge, La.		.80				1.25@1.50
Waco, Texas	.70@ .80	.70@ .80				1.10
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.			(Kaw river sand .75 per ton, carlots)			
Niles, Calif.	.80@1.00	.70@ .85	.75@1.00	.70@1.00	.70@1.00	.70@1.00
Pueblo Col.	.95*	.75*		1.50*		2.00*
Saratoga, San Jose, Calif.		.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Vancouver, Wash.		1.30*	1.45*	1.30*		1.10*
Yorkville, Ore.	.60	.60@ .75	.70	.60@ .75	.60	.50@ .60

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Boonville, N. Y.	.75	.75				
Burnside, Conn.	.80*					
Fishers, N. Y.			.70@.75 per ton, all sizes			
Yardville, N. J.		.50@ .75				
York, Pa.		1.10@1.30	(crushed rock sand)			
CENTRAL:						
Attica, Covington, Silverwood, Ind., Palestine, Ill.	.60	.60	.60	.60	.60	.60
Earlestead, (near Flint, Mich.)			.60 per yd.			
Eau Claire, Wis.					.75	
Escanaba, Mich.			1.00 cu. yd., all sizes			
Grand Rapids, Mich.	.40			.75		.60
Grass, Mich.		.60	1.00	1.00	1.00	1.00
Hersey, Mich.	.40			.60	.60	
Illinois, Northern					.50@ .60	
Janesville, Wis.		.65			.75	
Lincoln, Neb.			Sand gravel mix, 1.30			
Oxford, Mich.			Including cobbles, $1.00 per yd.			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Wabash Valley District, Ind.			.60 for all sizes			
Yorkville, Moronts, Oregon and Ottawa, Ill.			Pit run, .60			
SOUTHERN:						
Albany, Ga.	.70@1.00					
Dudley, Ky. (Crushed Sand)		.95		1.00		
Gravel Siding, Miss.			Mine run 45c per ton			
Lindsay, Tex.	1.00					.50
Thomas, La.						.40@ .70
Valde Rouge, La.						.60@ .75
Waco, Texas						.95
WESTERN:						
Niles, Calif.	.25@ .40					
Pueblo, Col.			River Run, .75* unscreened			
Saratoga, San Jose, Calif.		.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Yorkville, Ore.		.40			.40	

* Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Bethlehem and Emaus, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Buffalo, N. Y.	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Cleveland, Ohio.		.85		1.05	1.05	.95	.95
E. Canaan, Conn.	4.00	1.00	1.50	1.25	1.10	1.10	1.10
Erie, Pa.	2.00	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.		1.25	1.25	1.25	1.25	1.25	1.25
Ensley, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95
Hokendaugua and Topton, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Philadelphia Dist.	2.50	1.00	1.50	1.00	1.00	1.00	1.00
Pittsburgh, Pa., Dist.	2.05	1.15	1.50	1.15	1.15	1.15	1.15
Sharpsville, Pa.	2.00	1.20	1.60	1.20	1.20	1.20	1.20
CENTRAL:							
Chicago, Ill.	All sizes, $1.50, F. O. B. Chicago						
Detroit, Mich.	All sizes, 1.65, F. O. B. Detroit						
Ensley, Ala.	2.05	1.00	1.10	1.25	1.25	1.00	.95
Ironton and Jackson, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Toledo, O.	All sizes, 2.00, F. O. B. Toledo						
Youngstown, Dover, Hubbard and Leetonia, O.	2.00	1.20	1.60	1.20	1.20	1.20	1.20

Agricultural Lime and Hydrate

	—Agricultural Lime— Bulk	Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.			98	38	8.00
Apollo, Pa.	3.25		95.14	1.44	
Bellefonte, Pa.	7.00		98.5	.72	
Berkeley, R. I.		14.00	45	15	
Bridgeport, Pa.	7.50@9.00		55	44	9.00@11.00
Cavendish, Vt.	2.50 bbl. in car lots				
Cavetown, Md.	8.50				
Cedar Hollow, Devault, Rambo and Swedeland, Pa.	8.00	10.75 grd.	58	38	10.75
Chippewa, Pa.	5.50@6.00		78.67	1.33	
Farnams, Mass.	6.00	7.50	60	2	
Frederick, Md.	7.75		88	5 to 8	10.50
Grove City, Pa.	3.25	4.50	94.75	1.20	10.25
Grove, Md.	8.00				10.75
Highgate Springs, Vt.		8.00	85	2	
Hollidaysburg, Pa.	5.50@8.00		94.68		
Hyndman, Pa.	5.00	8.50	80.23	2.87	
Lime Bluff, Pa.	5.00@6.25		78.67	1.33	
Lime Kiln, Md.	8.00	10.75			10.75
Lime Ridge, Pa.	5.00@6.25		80.56 to 62.56	3.87 to 1.75	
Newburgh, N. Y.			57	38	8.00
New Castle, Pa.	3.50	4.50	47.6 to 50.4	0.62 to 1.12	
Paxtang, Pa.	5.00		60	12	
Rosedale, N. Y.	8.00		96	5	(Bulk, 6.00)
Sandville, O.					9.00
Steuben, Pa., Dover Plains, N. Y., York, Pa.		7.00@9.50	70		10.75 to 12.00
Union Bridge, Md.	8.50		73	1	10.75
Williamsport, Pa.	5.50	10.00	65 to 80	2 to 4	10.00
Williams Station, Pa.	7.50		60.6	39.1	9.75@10.50
York, Pa.	8.00		90 to 95	2 to 7	10.75
CENTRAL:					
Alton, Ill.	10.50		94.0		
Delaware, O.			50.0	5-12	10.50
Forest, O.	7.50				
Knowles, Wis.		10.00	55	45	9.50
Manistique, Mich.	10.00@11.00		95	2	12.00@13.00
Marblehead, Ohio			54	16.0	9.75
Mitchell, Ind.	9.00				11.00
Springfield, Ohio			33.62	17.73	10.50
Woodville, Ohio		9.25	47-48	31-32	10.50
SOUTHERN:					
Blowers, Fla.	5.00	7.25	98.0		
Burns, Tenn.	9.50		96	0.54	13.00
Chippewa, Fla.	5.00		80.0	15.0	
Dittlinger, Texas		9.00@11.00	98.62	0.29	12.50@15.00
Erin, Tenn.	9.50		97.82	0.12	
Karo, Va.	8.00		97.0	1.26	
Lineton, Va.	8.50		97	1.74	
Lushing, Va.	9.00	11.25	60	15	12.75
Maxwell, Va.	5.00		84	1.75	
Newala, Ala.	8.50@9.00		99.33		
Ocala, Fla.	4.00	6.00 pulv.	98½ (dry basis)		
Staunton, Va.	7.50		96.48		
WESTERN:					
Bellins, Wash.					12.00
Colton, Calif.	4.50		97	2	15.00
Lime, Ore.	15.00		91.48	0.58	
Oscas Island, Wash.		5.50			16.50
San Francisco, Calif.					15.00
Tehachapi, Cal.	6.00	8.00	96	2	

Miscellaneous Sands

(Continued from preceding page)

Bridgeton, N. J.—Core	2.00
Cleveland, O.—Molding coarse	2.50
Brass molding	2.50
Molding fine	2.75
Columbus, O.—Core	2.00
Brass molding	2.50
Molding fine, steel molding	2.50
Conneaut, O.—	
Molding fine	2.75@3.00
Molding coarse	2.50@2.75
Eau Claire, Wis.—Core	2.25
Brass molding and sand blast	2.25
Fleetwood, Pa.—Furnace lining	2.25
Franklin, Pa.—Traction	2.50
Brass molding	2.75
Molding fine, steel molding	3.00
Molding, coarse	3.00
Sand blast	5.00
Core	2.50
Greenville, Ill.—Molding coarse red	1.60@1.80
Guion, Ark.—Molding fine	2.00@2.25
Roofing	3.00
Stone sawing	2.50
Hancock, Md.—Core and brass mldg.	1.65
Hellam, Pa.—Core	2.00
Joplin, Mo.—Stone sawing, flint	1.25
Kansas City, Mo.—Missouri River core	.85
Klondike and Gray Summit, Mo.—	
Molding fine	2.00@2.50
Mapleton, Pa.—Molding, fine and core, damp	2.00@2.50
Molding, fine, dry	3.00
Massillon, O.—Molding fine	2.50
Molding coarse	2.50
Traction	2.50
Furnace lining	3.00
Core	2.50
Michigan City, Ind.—Core, bank	.50@.60
Traction	.50
Millington, Ill.—Roofing, stone sawing	2.00
Core and furnace lining	1.75
Core	1.50
Mineral Ridge, O.—Core, molding, sand blast, roofing, brass molding, etc., washed, screened (damp)	2.10
Montoursville, Pa.—Core	1.25@1.50
Traction	1.15@1.35
Brass molding	1.25
Ohio—Various points:	
Iron molding, fine	1.50@2.25
Iron molding, coarse	1.75
Brass molding, minimum	2.00
Oregon, Ill.—Core	1.75@3.00
Furnace lining	1.75@3.00
Sand blast	3.00@3.50
Molding fine	1.75@3.00
Ottawa, Ill.—Core, furnace lining, molding fine and coarse (washed and dried)	1.75@2.50
Core, furnace lining, molding fine (crude)	.75@1.00
Molding coarse (crude)	.75
Roofing line	1.75@3.00
Sand blast	3.00@5.00
Stone sawing	2.50
Traction	1.75@2.50
Brass molding	2.00@2.50
Providence, R. I.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.25
Sand blast	3.00@4.00
Sugar Grove, Ohio—Core (dried and screened)	2.00
Traction	2.00
Thayers, Pa.—Core and traction	1.75@2.00
Furnace lining, molding	1.25
Utica, Pa.—Core	2.00
Molding coarse, traction	2.50
Brass molding	2.75
Sand blast	3.50
Warwick, Ohio—Core, furnace lining, molding fine and coarse (dry and screened)	2.50@2.75
Core, furnace lining, molding fine and coarse (green)	2.25
Wedron, Ill.—Core, (crude silica)	.75@1.00
Molding fine, coarse	.75@1.00
West Albany, N. Y.—Molding fine	1.75@2.25
Molding coarse	1.50
Brass molding	1.75
Zanesville, Ohio—Molding fine and brass	2.00@2.50
Molding coarse	1.75@2.25

Gypsum, per Ton

Castalia, O.—Crushed, to cement mills	3.50
Ground, to cement mills	3.50
Land plaster	6.00
Bags extra—Jute, 3.00; ppr., 1.00 per ton.	
Fort Dodge, Ia., bulk	3.50
Garhutt, N. Y.—Land plaster, bags	7.00
Grand Rapids, Mich.—Crushed gypsum	7.00
Ground gypsum rock	9.00
Gypsumville, Man., Can.	3.50
Oakfield, N. Y.	7.00
Sandusky, O.	6.00
Jute sacks, $3.00 extra; paper, $1.00 extra.	

Ground Rock Phosphate

Centerville, Tenn.—B. P. L., 70%; ton, 2000 lbs. (90% thru 100 mesh)	10.00
Lump rock, 72% to 75%, B. P. L.	6.00@8.50
Centreville, Tenn.—B. P. L., 60%	7.00
B. P. L., 60% to 70%	7.00@9.00
Gordonsburg, Tenn.—2000 lbs. (90% thru 100 mesh)—B. P. L., 60%	6.00
B. P. L., 65%	7.00
B. P. L., 70%	8.00@10.00
B. P. L., 75%	12.00
Mt. Pleasant, Tenn.—(B. P. L. 68%) 13%	7.00
14%	8.00
Mt. Pleasant, Tenn.—B. P. L., 70%	10.00
Nichols, Fla.—Pebble, B. P. L., 68%	10.00
Wales, Tenn. (95% thru 100 mesh) (guaranteed 14% phosphorus equivalent)	7.00@8.25
Walls, Tenn.—B. P. L., 70.2%—	
To County Agri. Assns.	7.50
To others	7.75

Florida Soft Phosphate

Croon, Fla.—Ground pebble, 30%	16.00
Pulverized soft, 26%	17.50
Jacksonville (Fla.) District	10.00@12.00
(Add 2.50 for sacks)	
Phoslime, Fla. (in burlap bags, 100-200 lbs.)	15.00

General News from Rock Products Markets

Sentiment Reverting to Macadam-Type Roads?

THE RESOLUTION passed by the Louisville convention of the National Crushed Stone Association asking for a return to the macadam type of road construction, with 12 in. of pavement, may look like the verdict of a packed jury, but there appears to be a similar thought in the minds of people who are not biased.

An agricultural friend sends the following clipping:

ROAD CONSTRUCTION IN NEW YORK STATE.

"WHEREAS, The agricultural industry of the state is greatly handicapped by dirt highways which for long seasons are practically impassible for heavily loaded produce vehicles,

"WHEREAS, such a condition of our transportation facilities is not conducive to the greatest development of our agricultural resources and therefore, our food supply. Poor highways make transportation expensive and thus increase the cost of foodstuffs.

"WHEREAS, The high cost of improved highways under the present state contract system prohibits the rapid extension of such highways,

"WHEREAS, About 20 counties in the State of New York have adopted the country-township system for the construction of water-bound and bituminous macadam highways in accordance with the provisions of Section 320A of the Highway Laws,

"WHEREAS, Bituminous macadam highways can be built under the county-township system at a cost of from $5,000 to $7,000 per mile. In several instances in Tioga County during the summer of 1919, the cost of such highways will not exceed $5,000 per mile as compared with estimates of about $25,000 per mile (made during 1919) by the State Highway Department for the same type of highways built with the same materials, under the contract system,

"WHEREAS, The said system of township and county highways provides many connecting links and short routes between highways known as state routes and state and county highways thereby providing quick and cheap transportation of foodstuffs, not only for local people but also for traffic foreign to the county concerned.

"WHEREAS, Be it resolved that we, the representatives of the Farm Bureaus of the State of New York do hereby urge our legislative committee to work for legislation tending commonly known as County and Township Highways as provided in the Highway Laws and to secure adequate appropriations of state funds for the expansion of highways under such a system; that we favor the completion of the Highway Map of 1917 and that we also urge the supplying of funds by a bond issue or otherwise for those purposes."

Also the following editorial from the February 19 issue of the "Engineering-News-Record" is quite significant:

HIGH COST OF HIGHWAYS.

Engineers are fully convinced that, under normal conditions, expenditures for good highways are an investment that yields satisfactory returns to the public, but when costs have risen abnormally the investor must consider alternative plans for accomplishing the desired result. Last year we had to acquire the habit of considering $40,000 per mile as the proper cost for a road that could have been built for half that sum before the war. This year, if the bids recently received by the State of Pennsylvania are a fair criterion, we must decide to pay $60,000 for the identical product. Against an annual interest and amortization charge of $2,233 (interest at 4½ per cent and amortization in fifteen years) we now have an annual charge of $6,700—three times as much. No highway engineer who has any sense of values and the significance of figures can fail to set against these annual charges the cost of maintaining a cheaper type of pavement, even though he knows in advance that maintenance costs, too, have gone up. Already there is much talk of serious curtailment of highway programs until costs come down to approximately their pre-war level and when the annual charge for the better type of road will again, with a given traffic, be equal to or less than that of maintaining a cheaper surface.

More Tests of Hardening Accelerators of Cement

WASHINGTON, D. C.—Some very important results are being secured from the investigations which the U. S. Bureau of Standards is making into the use of cal in cement and concrete work.

Cal which had been stored in a cloth bag for about three years was compared with approximately fresh material to discover its effect on the hardening of portland cement mortar. Amounts were used which contained equal quantities of chlorine. The results indicate that cal does not lose its effectiveness as an accelerator upon exposure to the air. Work has been started with the object of determining the true composition of calcium-oxychloride crystals and their optical constants. Some conflicting data appear in the literature with reference to the composition of this salt, but none at all have been found which give the optical constants. This is important in connection with the work on cal, as it is believed that this substance is essentially calcium-oxychloride. A manuscript is being prepared to be submitted as material for a technologic paper which will give in detail the work done on cal.

In concreting one of the laboratory floors, practical tests of the effect of cal and calcium chloride on the rate of hardening of the top course mortars were made by comparing the rate of hardening of both treated and untreated mortar. The accelerated mortar was prepared by adding 5 lbs. of cal per bag of cement in the 1:2 mortar used for the topping. The relative rate of hardening of both the untreated and treated mortars was measured by the flow table method and the opinion of the floor finishers, as to the hardening of the mortars, was also obtained. Both mixes, when made, had a flow of 255; when 3½ hours old, the untreated mix had a flow of 186, while the one treated with cal had practically no flow. Up to 1½ hours the flow of the two mixes was practically equal, while at 3½ hours the accelerated topping had set to such an extent that it was difficult to trowel, while the plain topping was too soft to finish properly. The finishers' opinions coincide with the results of the rate of hardening tests. In other topping used in the floor, the saturated solution of calcium chloride in proportion to give a slightly less chlorine content than the cal was used, and similar early hardening was obtained as in the case where the cal was added. In both cases it was possible to finish the treated mortar in one-half the time necessary for the untreated mortar.

California Mineral Aggregate Producers Unite

THE UNION ROCK CO., Los Angeles,, Calif., has grown to be one of the largest producers of crushed stone and gravel in this section, due to recent acquisitions. The company, heretofore operating as a selling organization, was recently incorporated to engage in the producing end. It has acquired the rock plants of the Southern California Rock & Gravel Co., and the Pacific Rock & Gravel Co., while the local rock-crushing plant of the Russell-Greene-Foell Co. has also been purchased.

The new company in the future will operate a total of five plants for rock and gravel production, with maximum daily output of about 10,000 tons of material a day. The plants are located at Rivas, Puente Largo, Crushton, Kincaid and Saticoy. The works at the last noted places were opened early in January after having been closed down for some time past. W. L. Hodges, formerly president of the Pacific Rock & Gravel Co., heads the new corporation; H. G. Ferraud, previously an official of the Southern California Rock & Gravel Co., is vice-president.

Cement Exports for December

WASHINGTON, D. C.—Exports of cement during the month of December totaled 153,358 bbls., valued at $453,900, according to an announcement by the Department of Commerce, while our imports amounted to 200 lbs., valued at $2. Our most important customer for cement is still Cuba, which took about a quarter of the month's total exports.

Cement Exports in 1919

WASHINGTON, D. C.—Details of our export trade in cement during 1919 just secured from the Department of Commerce by the Washington Bureau of ROCK PRODUCTS, show that our shipments last year, although only about 200,000 bbls. over those of 1918, had an increased value of more than one and one-half million dollars.

A total of 2,463,689 bbls., valued at $7,516,019, were exported during 1919, according to the figures of the department, as compared with 2,252,446 bbls., valued at $5,912,166, in 1918, and 2,586,215 bbls., valued at $5,328,536, in 1917.

Eighty per cent of our exports, it is declared, are shipped to Central and South America, Brazil and Cuba being our most important customers.

Passed By The Screens

Incorporations

The Washington Sand and Gravel Co., 732 Munsey Building, Washington, D. C., has been organized, with J. G. Turpie as organizer.

Mount Robson Quarries, Ltd., 559 Pender Street West, Vancouver, has been incorporated with a capital of $500,000 to manage plants for quarrying rock and stone.

The New York and Nova Scotia Gypsum Corp., New York City, has been incorporated with 10,000 shares common stock of no value. The working capital is $117,600.

Toronto Cement Products, Ltd., Toronto, has been incorporated with a capital of $40,000 to manufacture and deal in brick, terra cotta, cement, lime and crushed stone.

The Consolidated Asbestos, Ltd., Montreal, Que., has been incorporated with a capital of $10,000,000 to mine, manufacture and deal in stone, rock, feldspar, asbestos, etc.

The Superior Limestone Co., Batesville, Ark., has been incorporated to develop 36 acres of limestone. Limestone pulverizing machinery will be installed. J. B. Harvey is named as the incorporator.

Pfaff and Smith Building Supply Co., Charleston, W. Va., has been incorporated to operate a gravel plant. The capital is $200,000 and the incorporators are Adam Pfaff, Adam Smith and D. A. Jayne.

The Kinzel-Thompson Sand and Gravel Co., Knoxville, Tenn., has been incorporated to produce, wash, size and store gravel. It has a storage capacity of 42,000 cu. yds. F. L. Conner is president. The capital is $45,000.

The Wilcox Co., 3700 Milwaukee Avenue, Chicago, has been incorporated with a capital of $125,000 for the purpose of mining and shipping sand and gravel for structural purposes. The plant is at Janesville, Wis., and the manager is Julius Mosser.

The Mermac Portland Cement & Material Co., Wilmington, Del., has been incorporated with a capital of $400,000 to manufacture Portland cement and other building materials. The local incorporators are H. E. Knox, T. L. Croteau and S. E. Dill.

The Ontario Cement, Ltd., Brantford, Ontario, has taken out a provincial charter with a capital of $600,000. The provisional directors include H. J. Reid, J. H. W. Tooze, and W. I. Dickinson. They will deal in and manufacture rock, lime, cement, etc.

The American Sand and Gravel Co., 133 West Washington Street, Chicago, has been licensed in the state of Wisconsin to operate a sand and gravel pit near Trevor, Kenosha County, Wis. The capital is $100,000, of which $65,000 is paid in. L. E. Geer is treasurer of the company.

The Bloomfield Washed Sand and Gravel Co., Greenfield, Ind., has been incorporated with a capital of $100,000 to produce and deal in building materials. The directors of the company are M. E. Dugger, E. H. Dugger, O. E. Dugger, Palmes Boles and G. V. Gladville.

The M. and E. Sand and Gravel Co., Minneapolis, Minn., has been incorporated under the laws of the state of Minnesota to produce, wash and deal in sand and gravel and crushed stone. The capital is $50,000 and the incorporators are E. G. Evenstra, H. S. Morton, and J. H. Morton.

The Limestone Products Co. has been incorporated under the laws of the state of Pennsylvania for the purpose of producing and marketing crushed stone, lime, and road material. The incorporators are B. O. Harter, W. D. Kochersperger and Mary R. Stitzer. The solicitor is J. A. Beard, Mifflinburg, Pa.

The Medford Washed Sand and Gravel Co., Medford, Iowa, has been incorporated for the purpose of excavating, washing, cleaning and dealing in sand and gravel. The capital is $150,000. The incorporators are E. M. Sabin, president; Iver Iverson, treasurer, and R. M. Weblemoe, treasurer, all of Northwood, Iowa.

The Rapids Granite Co., St. Cloud, Minn., has been incorporated under the laws of the state of Minnesota for the purpose of operating quarries and cutting and manufacturing marble, etc. The capital is $125,000 and the incorporators are R. G. Neil, president; T. G. Schaefer, vice-president, and J. P. Keller, secretary-treasurer.

Personals

S. B. Chittenden, sales manager of the Sandusky Cement Co., 818 Engineers Building, Cleveland, Ohio, has recently resigned. The vacancy will be filled some time before the middle of February. Mr. Chittenden has laid plans for some other enterprise which is to be announced later.

OBITUARY

W. E. Martin, who has been treasurer of the H. K. Porter Co., Pittsburgh, Pa., for 45 years, died January 12, 1920.

E. H. Lyons, president of the Standard Lime and Stone Co., Fond du Lac, Wis., and a member of the Wisconsin Senate from 1908 to 1920, died suddenly of heart failure on January 16, 1920, while at the stone quarry on a business trip.

Mr. Heller, for 12 years traveling erector for the Bradley Pulverizer Co., Allentown, Pa., died of the influenza at Allentown. Before coming to the Bradley Pulverizer Co., Mr. Heller had long been promment in the cement industry. In the capacity of traveling erector he has erected Griffin mills and Bradley Hercules mills in almost every section of the world.

Ohio C. Barber, 79, millionaire match king, producer of agricultural limestone and crushed stone and known as the organizer of the "daddy of all trusts," died at his model farm near Barberton, Ohio, of pneumonia, caused by influenza. His estate was estimated at $10,000,000. Barber was born at Middlesbury, Ohio, April 20, 1841. In 1856, after a common school education in Akron, he entered his father's match factory in Middlesbury, and was taken into partnership in 1861. His genius for organization, foresight, and indefatigable labor asserted itself immediately, and in 1881 he formed the Diamond Match Co., which absorbed a number of plants engaged in the same business. Ten years later he laid out the town of Barberton, named after himself, and gave employment to thousands of persons in the surrounding territory. The town now has a population of 22,000. Barber interested himself in scientific farming. He took over a tract of 1,300 acres near Barberton and turned it into what was known as "The Model Farm." Western Reserve University of Cleveland will have the place for experimental purposes, under the provisions of his will. The farm is valued at $4,000,000.

Quarries

The Blair Quarry Co., Inc., of Columbia, S. C., is opening up an extensive quarry operation at Blairs, S. C.

C. J. Burbank of Enid, Okla., has announced that three new stone crushing plants will be installed near that city to be ready for operation by March 1.

The Duluth Crushed Stone Co., Duluth, Minn., has filed amended articles of incorporation in which the capital is increased from $150,000 to $300,000. F. A. Brewster is president and C. D. Brewster is vice-president.

The Russell & Brand Granite Co., Inc., of Barre, Vt., has filed with the Secretary of State, at Montpelier, Vt., a certificate amending the articles of association to enable an increase in capital stock from $5,000 to $50,000. Waldron Shield is president and Mason O. Pierce is clerk of the company.

The Texas Granite Co., Llano, Texas, has been reorganized with a capital stock of $350,000. It owns extensive granite quarries near Llano and is getting out five cars of stone a week. The Texas Granite Co. is a subsidiary of the Southern Marble and Granite Co. of Yoakum, Texas, which has a capital of $1,000,000.

The Armfield-Cartwright Stone Quarry Plant, two miles west of Muncie, Ind., is now being dismantled and the machinery shipped to Greencastle, Ind., or Ridgeville, where the company has other large similar holdings. The plant has not been in operation for several years.

L. S. Patterson has purchased a farm of 120 acres at Woodstock, Md., and will open a feldspar quarry soon.

The Oxford Quarries, Incorporated, Wilmington, Del., has filed a change in the articles of incorporation to raise the capital stock from $375,000 to $400,000.

W. G. Ballard, Reidsville, N. C., reports that he owns a suitable deposit of limestone and that he is intending going into the quarrying business. In the past Mr. Ballard has maintained the Carolina Kennels and is a breeder of Airedale terriers.

The Linwood Stone and Cement Co., Davenport, Iowa, which has recently been reincorporated by J. W. Crowley, president, and J. T. Schroeder, secretary, has filed amendment to the articles of incorporation to increase the capital stock from $250,000 to $300,000.

The Grance Stone Co., Toledo, Ohio, reports that it will open its large stone quarry at Kenton, Ohio, on April 1. This plant has a capacity of 45 cars per day and was not operated last year because of the business conditions. About 50 men are employed at the plant.

The Farmers' Co-operative Limestone Co., Branchville, N. J., held its annual meeting of the board of directors at which time the following officers were elected for the year 1920: President, Theodore M. Roe; vice-president, Linus Clark; secretary and treasurer, Irving N. Roe, Linus Clark and J. H. Nelden were appointed a committee to audit the treasurer's report. A resolution was passed to hold a regular meeting on the last Saturday of each month until further notice.

The Rhodes Construction Co., Franklin, Tenn., has purchased the large crushing plant of the W. J. Sparks Construction Co., Lewisburg, Tenn. The Rhodes Construction Co. will start at once to rebuild the old crushing plant to increase the production and to replace old types of machine so that a larger number of commercial products may be produced. One of the main products will be agricultural limestone.

The Marble Cliff Quarries Co., Columbus, Ohio, has amended its articles of incorporation to increase the capital from $500,000 to $1,000,000. The increase in capital is necessary to take care of the extensive program of improvements contemplated. Among the improvements will be the acquisition of additional lands adjacent to its property at Marble Cliff, a suburb of Columbus, the erection of a large stone crusher and the installation of other equipment. The plant is one of the largest in the middle west and is expanding rapidly. Through error the above article appeared on page 50 of the February 17 issue of Rock Products under the name of the Casparis Stone Co. W. H. Hoagland, general manager of the Marble Cliff Quarry Co., very kindly informed us of this mistake, thus enabling its correction.

The Golden State Mining and Marble Co., San Diego, Cal., is developing a valuable deposit of marble near Coyote Mountain on the San Diego and Arizona Railroad. This stone will be used for building purposes. But little development work has yet been done on this property, but still enough to show that it is a large deposit of marble of wonderful variety and beauty of coloring. A quantity of two varieties, the Imperial blue-black and Imperial rose, is now being sawed at the mill of the Lyman Onyx and Marble Co., also of San Diego. The blue-black will be used by a local contractor for monumental work, taking the place of Vermont marble, which has heretofore been used. Samples of these marbles have been tested by government experts and assurances have been given that the stone will be used in the construction of public buildings.

The Texas Stone Co., whose main offices are in the Andrews Building, Dallas, Texas, is rapidly completing its new plant at Chico, Texas. Officials of the company expected to have the new plant in operation by the first of the year, but unfavorable weather conditions interfered with their work very badly, according to G. L. Meholin, secretary.

When this plant is completed it will have a capacity of 60 to 80 cars of crushed stone per day, double shift. Forty-five carloads of machinery, lumber and other materials have been received and a few more are yet en route. This, in connection with machinery, switches, siding, etc., already in operation on their properties, indicates something of the magnitude of the plant being built, which is without doubt the largest and most modern equipped crusher plant in the South, says Mr. Meholin. The company is installing its own light and power plant and will, in a short time, build cottages for its employes. Heavy track scales are also being installed and a billing station very probably will be designated a little later. This company is capitalized at $475,000 and recently incorporated.

Sand and Gravel

Hazleton Gravel Co., Hazleton, Ind., has increased its capital from $5,000 to $50,000.

The King Construction Co., Knoxville, Tenn., is erecting a new sand and gravel plant east of Columbus, Miss., which will have a daily capacity of 45 cars.

The McGrath Sand and Gravel Co., it is stated, will build a new sand and gravel plant at its pit south of Mackinay Junction, Ill., on the I. T. S.

The Eau Claire Sand and Gravel Co., Eau Claire, Wis., has filed amendments to articles of incorporation to increase the capital stock from $50,000 to $75,000. F. E. Nicoles is president.

The Spring Creek Limestone Co., Lebanon, Pa., elected the following officers at its annual meeting: A. S. Herr, president; S. A. Royer, secretary-treasurer; L. R. Reigert, solicitor, and E. R. Royer.

John C. Bosley, Baltimore, Md., has purchased the Texas plant of the Poole Engineering and Machine Co. The property contains 314 acres of land and a number of buildings. Mr. Bosley will develop limestone quarries on a part of the property.

The State of Pennsylvania will operate its quarries and sand banks for road construction, as authorized by the last Legislature; they will be in the charge of D. H. Hepburn, now connected with the Philadelphia city government. Chief Engineer W. D. Uhler has located suitable stone and sand deposits and the highway department has effected numerous leases from which the material will be obtained.

The Greenville Gravel Co., Greenville, Ohio, held its sixth annual meeting and banquet at the company headquarters on January 16, 1920. The affiliated interests of the Greenville Gravel Co. include the Western Indiana Gravel Co., the Kalamazoo-Greenville Gravel Co., the Detroit-Greenville Gravel Co., the Arkansas Gravel Co., the Greenville Manufacturing Co., and the Allied Belting Co. of Toledo. The annual meeting of the organization is for the purpose of a joint conference of the officers and district managers to discuss plans and policies for the ensuing year.

The Casco Gravel Co. held its annual meeting of the board of directors at the home offices in Clintonville, Wis., at which time the following officers were elected: President, W. A. Allen, Green Bay; vice-president, George Shackett, Clintonville; secretary and treasurer, G. W. Rickert, Black Creek. The Casco Gravel Co. has its gravel pits at Casco Junction. Since the reorganizing of the company many improvements have been made to the property. Six new bins have been built and as soon as spring opens $15,000 worth of new machinery will be installed and 1500 ft. of side track will be built to the pits by the Green Bay & Western. With the commencement of business the company will have an initial output of at least 15 cars daily and will double this amount when the season starts in good shape.

Retail Dealers

J. and S. S. Thompson Co., Inc., Elizabeth, N. Y., has been incorporated under the laws of New Jersey to deal in building material. The capital is $200,000.

The Bay Ridge Building Materials Co., Brooklyn, N. Y., has been incorporated to deal in building material. The capital is $50,000 and the incorporator is M. La Peluso.

The Concrete Material and Sand Co., Cleveland, Ohio, has been incorporated with a capital of $300,000 to deal in sand and building material. B. L. Benfer is one of the incorporators.

Crookston Tile and Brick Co., Crookston, Minn., has been incorporated to manufacture and deal in sand, gravel and cement. The capital is $50,000 and the incorporators are S. Steenerson, I. Mickelson, W. L. Ireland, R. C. Jones, and D. B. Smiley.

The Eastern Lumber and Supply Co., Boston, Mass., has been incorporated under the laws of the state of Massachusetts to deal in lumber and builders' supplies. The capital is $100,000. The incorporators are W. F. Eccles, president; W. S. Watts, treasurer, and R. W. Burns.

Chas. J. E. Anderson, Chicago, Ill., announces that he has resigned as president of the Craig Material Co., with offices at 139 North Clark Street, and has organized the firm of Chas. J. E. Anderson & Co., at 920-921, 105 West Monroe Street. Mr. Anderson is senior partner and manager of the new company. It will deal in coal, sand, gravel, cement, lime, etc.

The Iron City Sand Co. held its annual meeting of the stockholders at the company offices, Bessemer Building, Pittsburgh, Pa., and elected the following men: Harry G. Pfeil, president; Philip M. Pfeil, Jr., vice-president; Howard G. Owens, secretary and treasurer; Joseph A. E. Hoeveler was elected a director of the company and made sales manager.

The Reedy Concrete and Construction Co., Reedy, W. Va., has been incorporated with a capital of $25,000. The incorporators are J. Stutler, James M. Daniell, L. V. Tennant, A. B. Thorn and others.

The Perry Sand and Coal Co., Columbus, Ohio, has been incorporated to deal in coal and builders' supplies. The capital is $10,000 and the incorporators are E. A. Wheeler, D. L. Mason, C. G. Kern, E. Kern and O. C. Roush.

The Block Automatic Co., Muscatine, Iowa, has been incorporated to manufacture and deal in cement, brick, tile and building material. The capital is $100,000 and the incorporators are F. O. Block, W. R. Jayne and R. Rauch.

Iowana Gypsum Products Co., Ft. Dodge, Iowa, has been incorporated to mine, manufacture and market gypsum and its products. The capital is $250,000 and the incorporators are L. E. Armstrong, president and treasurer; A. J. Armstrong, vice-president and J. M. Norton, secretary.

New Munich Cement and Products Co., New Munich, Minn., has been incorporated under the laws of the state of Minnesota for the purpose of the manufacture and sale of cement blocks, tile, etc., and to deal in cement, brick, etc.; also to build sidewalks, bridges, culverts, etc. The incorporators are John Bentfield, Mathias Worms, Herbert Worms and George Wiebolt, all of New Munich.

The Consumers Building Material Co., Pierre, S. D., has been incorporated with a capital of $100,000 for the purpose of engaging in wholesale and retail handling of building materials and supplies, consisting principally of cement and stucco products, stone, common and pressed brick, tile drain pipes, etc. The incorporators are: R. W. Chambers, G. W. Kulhavy and L. L. Stephens.

The Simonds Manufacturing Co., Pittsburgh, Pa., manufacturers of gears and pinions for electric railways, mines and industrial haulage, and special gearing of all kinds has ready for circulation a very complete hand book on "Simonds Gears." This treatise not only contains information regarding construction, uses and strength of all types of gear, but there is also valuable data and general information for users of gear driven machinery. A number of detail and design drawings are used in the theoretical explanation of gear cutting. A considerable portion of the book contains tables, rules, and useful information such as would make this book valuable to have on hand at all times. Those interested in gears may obtain all this information by writing for this book.

Lime

The Kelley's Island Lime and Transportation Co. of Cleveland, Ohio, through its officers at Sandusky, Ohio, announces the sale of the sand steamer, Mary Groh, to the Toledo Pulp Plaster Co.

Cement

The Canada Cement Co., Montreal, Que., has declared a dividend of 1¾ per cent for the three months ending December 31, 1919. This is at the rate of 7 per cent per annum.

The Santa Cruz Portland Cement Co., whose main offices are in San Francisco, and whose plant is at Davenport, Cal., reports that orders for approximately 1,000,000 bbls. of cement have already been booked. It is stated that this is the best start of the operation year that the company has had in four years.

The Canada Cement Co.'s plant at Lakefield, Ont., will be operated again at an early date, according to recently announced plans. Manufacture of cement at Lakefield was suspended soon after the outbreak of war. A shortage in the supply of foreign labor has been a delaying factor in connection with resumption of operations there. Electric furnace equipment was installed in the plant over a year ago for the manufacture of steel from shell turnings, but this was not completed soon enough to be of use before all war operations were suspended in November, 1918.

The Giant Portland Cement Co., main offices at Philadelphia, Pa., reports for the fiscal year ended December 31, 1919, gross earnings of $2,010,487, compared with $1,629,521 in 1918, an increase of $380,965. Net earnings from operation totaled $459,665, compared with $117,686 in 1918. Balance, after payment of bond interest and reserve for depreciation and taxes of $152,790, totaled $273,125, compared with a loss in 1918 of $4081. C. F. Conn, president of the company, in his annual report, says: "The central mill, which has been closed down since September, 1917, will be placed in operation early in the year. Sales contracts for delivery in 1920 are the largest in the history of the company."

Gypsum Products

The American Gypsum Co. officials, meeting at Port Clinton, Ohio, have decided to build a lime products plant at Gibsonburg, Ohio, to cost $200,000.

The United States Gypsum Co., Chicago, Ill., has requested that trading in its proposed new common stock be delayed until enough of the old stock is deposited to insure adoption of the recapitalization plan.

The United States Gypsum Co., main offices in Chicago, has just officially made the announcement regarding recapitalization. A committee consisting of S. L. Avery, S. Q. Fulton, Ralph Van Vechten, S. T. Meservey and O. M. Knode have been selected to handle the matter and the Continental and Commercial Trust and Savings Bank has been appointed depository to receive the certificates of stock and to issue temporary certificates. The company will be changed from a New Jersey to an Illinois corporation and 100,000 shares 7 per cent cumulative preferred stock at $100 par and 400,000 shares of common stock at $20 par value issued. The new preferred shares will be exchanged for the old preferred share for share and the common on the basis of five of the new for one of the old. This arrangement will give $6,000,000 outstanding preferred and $4,000,000 common. A total of $4,000,000 preferred and $4,000,000 common will remain unissued.

Phosphate

The Seminole Phosphate Co., Croom, Fla., a lately noted incorporation, has acquired 600 acres of property and is installing a mining plant. The capital is $300,000.

The Southern Phosphate Co., recently organized plans to buy land in Polk County, Florida, estimated to contain 26,500,000 tons of phosphate rock and three mining plants. It is proposed to increase the output to 700,000 tons annually. The office is with the Hayden Stone Co., New York City.

With the purpose of developing large phosphate beds at Maxwell, near Philipsburg, Mont., a fertilizer plant is to be erected at Maxwell early next spring by Fred Irwin and F. J. Russell at a cost of $250,000 to $300,000. They declared they were assured of contracts for the delivery of 80,000 tons of fertilizer annually to the Japanese government, and are negotiating with a concern with large plantations in Hawaii.

Potash

The Liberty Potash Co., whose plant is at Salt Lake City, Utah, is in the hands of the receivers as a result of a suit brought against it by the Morrison, Merrill and Co. The former company is incorporated for $11,000,000.

The United States Potash and Brick Corporation, Roanoke, Va., has issued bonds to the amount of $600,000. The company has invested about $500,000 for special research, a small commercial plant, etc., and intends proceeding with its activities to an annual capacity of 6,000 to 7,000 tons of potash from feldspar and 100,000,000 brick from the residue. It is claimed that the engineers of the Roanoke company have perfected a process for the extraction of potash from feldspar to such a degree that the product of this company alone will prove an appreciable factor for supplying the American market with potash for fertilizer manufacture. The lands from which the feldspar is obtained are in Virginia.

Manufacturers

The Valve Bag Company of America announces that the above name will be the new title of the Urschel-Bates Valve Bag Co. All business will be handled through the head offices at Toledo and under the same management as heretofore. C. H. Hartman is secretary and L. H. Hartman is manager and treasurer of the Valve Bag Company of America.

The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., announces the appointment of the following: Alexander Taylor, for many years manager of works, has been made assistant to vice-president in general charge in all plant operation, stocks and stores. R. L. Wilson has been promoted from position of general superintendent to works manager of the East Pittsburgh works. E. R. Norris has been appointed director of works equipment in charge of machinery, tools and methods in the various plants. C. B. Auel has been made manager of the employes service department.

The National Compressed Air Machinery Co., Los Angeles, Cal., compressed air engineers and manufacturers of compressed air machinery, has ready for circulation bulletin No. 17 on Air Compressors. This catalog embodies the details and construction of both the vertical and horizontal type—those to be driven either by belt or motors attached. The information is very definite and concise so that the purchaser of compressed air equipment can easily select the machine best suited to his particular needs. The National Compressed Air Machinery Co. will gladly send a catalog to anyone interested in the latest designs of these machines.

The Easton Car & Construction Co., in order to give its customers in the Detroit district the service that the business demands, have opened a branch office in Room 400, Penobscot Building, Detroit, Mich., in charge of H. H. Siff, the district sales engineer, who is experienced in industrial railway matters and whose services are at the command of those interested. Through this new branch office industrial railway users may secure quick, accurate and dependable engineering services and the solution of difficult problems in special equipment. The Easton company announces that their branch office will carry a stock of spare parts as soon as the demand for such service makes it advisable.

Hendricks' Commercial Register of the United States for Buyers and Sellers 28th Annual Edition 1919-1920 S. E. Hendricks Co., Inc., New York, $12.50.—The 28th Annual Edition of "Hendricks'" Commercial Register of the United States for Buyers and Sellers for 1920 has just been published, after being delayed for two months by the strike of the printers in New York. The new edition contains several improvements. The most noticeable being the new method of exterior indexing by coloring the front edge red, white and blue, to indicate the different main sections of the book. First is blue, on which is stamped the words "Trades Index." This is a section of 162 pages in which every product listed in the book is indexed and cross indexed for ready reference. The red section is the main classified trades list. It contains 1813 pages, listing over 18,000 different products. In the present edition we find over 1200 new headings, including many headings completely covering the chemical industry. The third section of the book as indicated by the white edges contains 216 pages, listing the trade names under which products are manufactured, with the name and address of the manufacturer. The second blue section is the Alphabetical section of 487 pages containing all the names in the book in one alphabetical list with addresses, and their main line of business. This is followed by the index to advertisers of 20 pages, containing a full list of branch and foreign offices following each name. The whole book makes a volume of 2703 pages.

R. E. S. Geare has been appointed General Sales Manager of the T. L. Smith Co. of Milwaukee, manufacturers of concrete mixing machinery and contractors' equipment. He will be

in charge of the company's general sales offices, Old Colony Building, Chicago, where the advertising and sales departments are now located. For the past four years Mr. Geare has operated under the firm name of Geare and Company, Engineers, specializing in sales engineering in the construction and power-plant field. The Geare and Company handled the business for the T. L. Smith Co., the Manistee Iron Works and others.

The Columbus McKinnon Chain Co., general offices at Columbus, Ohio, has ready for circulation a very useful 20-page booklet of information on "Chains." This company manufactures all kinds of welded chains, from the little No. 6 Liberty Coil, made of 5/64 in. material, to the ponderous anchor chains used on vessels and made from iron 3 in. in diameter. The various uses and the methods of manufacturing of chain are illustrated and described. Compact tables giving complete information about chains so that the purchaser could order from them, is a feature of this booklet worthy of consideration. The Columbus McKinnon Chain Co. will send these booklets for the asking.

Is Your Property Insured by a British Company?

WASHINGTON, D. C.—Business men and property owners whose insurance policies were furnished by foreign insurance companies should make sure the amount thereof is stated in terms of United States currency, because of the low foreign exchange, according to Representative Edmonds of Pennsylvania, who has been making a study of fire and marine insurance problems.

"Hundreds of millions of dollars of insurance in this country are written in British companies and are payable in pounds," points out Mr. Edmonds in his warning. "A policy in an English company, which before the war in the event of a loss would pay $1,000, at the present rate of exchange would pay, in round figures, about $600.

"Every person having a policy of insurance protecting him against fire loss should investigate it and, if written in this manner, with the protection stated in the currency of the country in which the home office of the insurance company is located, should insist upon having an agreement that it is to be paid in dollars

USED EQUIPMENT

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Immediate Delivery

10K GATES, mang. fitted. Reg. drive, 50 ft. elev. 2 screens. **All $8500.00.** Prac. new.
20—Crushers, Nos. 2 to 10 mostly Gates.
1—327 HP. W. T. Boiler. $8.00 HP.
9—150 HP. 125 lb. H.R.T. boilers, butt strap.
2—48"x12' Taylor Manganese screens.
25—Air compressors, 60 to 4000 cu. ft.
50—Steam engines, 30 to 1500 HP.
1—95 HP. Loco. type boiler. Ill. ship.
75—Steam and Centrifugal Pumps.
1—30-60 HP. Emerson-Brantingham tractor.
Concrete mixers—Contractors Equip.

Send us your inquiries for electrical equip., engines, hoists, etc.

Ross Power Equipment Co.
Indianapolis, Ind.

FOR SALE

One 12-inch Erie Sand and Gravel Pump, elbows, nipples and drive pulley. Pump used less than week, shows no wear

NICKEL PLATE GRAVEL COMPANY
313 Commerce Building **Erie, Pa.**

FOR SALE

150—Elevator buckets, ten gauge steel 24" x10"x13½" for 26" elevator. These buckets are warranted to be in first class second-hand condition and are offered for sale because no longer needed, our method of elevating material having been changed to belt conveyor.

THE CARMICHAEL GRAVEL COMPANY
Williamsport, Iad. **St. Louis, Mo.**

WANTED

Chain hoist, from 12 to 20 tons, and overhead traveler to carry. Address

Box 1383, Care of Rock Products

FOR SALE

One number three Keystone Lime Kiln in first-class condition. Also, large quantity of fire brick for lining same.

ACME LIMESTONE CO.
Alderson, West Virginia

Idle Machinery Absorbs Profits

This department is the medium for the men who keep the wheels going. Sell your idle machinery to the man who'll keep it going.

USED EQUIPMENT

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Repaired Contractors' Equipment

Steam Shovels

Model 60 Marion Shovels, 2½-yard dippers, Nos. 1999, 2059

1—Model 28 Marion, full revolving, ⅝ yd. dipper.

1—Model O Thew, ½-yard dipper, full revolving, on traction wheels.

Hoisting Engines

1—8½ x 10 DC 2-D Lambert, with boiler

1—6 x 10" DC 2-D Byers.

1—6¼ x 10 DC 2-D Mundy, with attached swinger and boiler

Cableway

1—Lidgerwood Cableway, 1164-ft. span, with 9 x 10" DC Reversible Link Motion Cableway Engine, 3-ton capacity

We have a large stock of thoroughly repaired Construction Equipment of all kinds ready for immediate shipment.

Locomotives

1—3-ton Fate gasoline locomotive, 36" gauge.

1—14 x 20" standard gauge saddle tank Locomotive.

2—American 10 x 16" Locomotives, 36" gauge, with butt joint boilers

4—18-ton 10 x 16" Dinkeys, 36" gauge

Clam Shell Buckets

1—1½-yard Browning.

Cars

20—12-yard Western Air Dump, standard gauge, 26 ft. bed.

26—12-yard Western air-dump standard gauge cars, 19' bed.

H. KLEINHANS COMPANY

Union Arcade **Pittsburgh, Pa.**

WANTED

A large size second Jaw Crusher, also elevator and screen. State condition and lowest cash price.

B. F. Pope, Law Bldg., Baltimore, Md.

New—RAILS—Relaying

All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

M. K. FRANK

Frick Building **Pittsburgh, Pa.**

WANTED COMPLETE

30" conveyor outfit, 253' centers, including head and tail pulley, takeups and carriers, return rollers and guide rollers—everything except belt. Address

Box 1375 **Care of Rock Products**

MACHINERY FOR SALE

One 5x3½-ft. and two 6x6-ft. Smidt kominuters.

Three Emerick 10-ft. separators.

Three 33-in. Fuller-Lehigh mills.

Also a lot of kilns, dryers, crushers, tube and ball mills.

W. P. HEINEKEN, Engineer, 95 Liberty Street, New York City

Wanted for Immediate Delivery

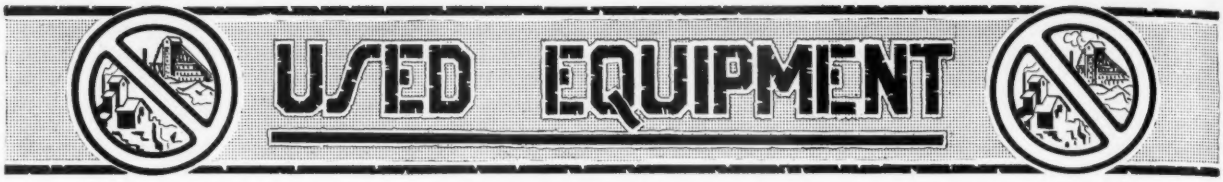
One No. 6 McCully or one No. 6-K Gates Crusher. State age, condition, best price and location.

BIRMINGHAM SLAG COMPANY
1607-1616 Jefferson County Bank Building
BIRMINGHAM, ALA.

WANTED

No. 7½ gyratory crusher, second-hand; also elevator and screens. State condition and lowest cash price.

Box 1372 **Care of Rock Products**



COMPRESSORS

1—1200′ Franklin 2-stage Belt Drive (new) $2,500
2— 750′ Sullivan 2-stage Belt Drive, each 2,000
2—1500′ Sullivan Comp. 2-stage Corliss Steam, each..... 4,500
1—1000′ Ingersoll straight line steam 2,000

DRILLS

8—Chi Pneumatic Air, 3¼, with Tripods,each ..... $ 100
1—Loomis Well Drill..... 1,500

DERRICKS

1—Stiff Leg 70′ boom, 40′ mast, 14′ bullwheel ..... $ 900
1—Guy 60′ boom, 65′ mast..... 500

HOISTING ENGINES

1—7x10 Flory D.C.D.D. with boiler and swinger 1,200
1—7x10 Flory D.C.D.D. with boiler 1,000
1—8½x13 Mundy D.C., 3 Drum, with boiler 2,000
1—12x14 Special Dragline Engine (new) 2,000
1—36x36 Allis-Chalmers Friction Hoist 400
1—12-H.P. Fairbanks-Morse Gasoline D.D. Hoist 850

LOCOMOTIVES

2—10x16 Vulcan Saddle Tanks, 36" ga., each..... 3,000
2—9x14 Davenport Saddle Tanks, 36" ga., each..... 2,000
3—7x12 Porter Saddle Tanks, standard ga., each..... 2,000
1—14x24 American Saddle Tank, standard ga., almost new.....10,000
1—6 Wheeled Switcher, stand. ga. 9,000

PUMPS

1—12" Centrifugal with 75-H.P. Motor ..... $ 800
1—12" Centrifugal Sand Pump, Belt Driven 500

CARS

18—2½-yd. All Steel End Dump Quarry Cars (fine), each.....$ 90
20—1½-yd. Western Side Dump 24" Contractors Cars, each.... 50

SCREENS

2—32"x10′ Austin Screen, iron work only, each.....$ 300
1—42"x16′ Gates Light Type..... 400
1—40"x16′ Gates Heavy Type..... 750
2—60"x24′ Mang. Heavy Type, ea. 2,000

ROLLS

2—36"x14" United Iron Works, ea...$1,000
1—24"x14" United Iron Works..... 750
1—42"x16" Power and Mining..... 2,500

ENGINES

1—150-H.P. Atlas Automatic .....$ 750
1—200-H.P. Allis-Chalmers Corliss 1,250
1— 20-H.P. Erie Center Crank..... 200
1— 50-H.P. Atlas Automatic 300
1— 15-H.P. Keystone Reversible.... 250

BOILERS

1—80-H.P. Vertical .....$ 850
1—60-H.P. Vertical 750
1—50-H.P. Vertical 750
1—80-H.P. Butt Strap Locomotive Type 900
1—80-H.P. Butt Strap Tubular..... 850

CRUSHERS

1—7½ Austin Gyratory.....$2,500
1—7½ Gates Gyratory 2,500
1—5 Austin Gyratory..... 1,500
1—4 Gates Gyratory..... 900
1—24x36 Farrell Blake Jaw.....4,000
1—20x24 Blake Jaw..... 2,000
2—24x24 Blake Jaw, each..... 3,500
1—12x24 Reliance Jaw..... 1,000
1—10x18 Jaw Crusher on truck with elevator bins and screens 1,200
1—6x12 Blake Jaw..... 450

MACHINERY SALES COMPANY

745 OLD COLONY BUILDING **CHICAGO, ILLINOIS**

If you don't find it advertised in Rock Products we will help you get it

Complete Information Service—Just ask us when you desire catalogs or information in a hurry. No charge. For quick action use this form.

I want catalogs of.....

Where can I buy.....

Who manufactures .....

Am in the market for.....

My name is .....

My business is.....

My address is—Street..... City..... State .....

Mail to ROCK PRODUCTS, 542 South Dearborn Street, Chicago, Ill.

When writing advertisers please mention ROCK PRODUCTS

CLASSIFIED ADVERTISING

Rates for advertising in the Classified Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Help Wanted

Wanted

Two Agricultural Limestone Salesmen for Central California. Address

KAWEAH LIME PRODUCTS CO.,
302 Cory Bldg. Fresno, Cal.

WANTED

Experienced, practical superintendent with thorough knowledge of operation of trap rock crushing plant, consisting of 60" x84" Jaw Crusher, nine gyratory crushers, electrical driven, 90-ft. quarry face. Must have thorough knowledge of economical production for continuous operation.

Box 1379, Care Rock Products

WANTED

A purchasing agent. Only one with experience need apply. Man under 35 or 40 years of age preferred. Address

Box 1381 **Care of Rock Products**

WANTED

Assistant superintendent for cement plant. Mechanical engineer, with experience in design and construction of cement plants preferred. State age, experience, references and salary expected. Address

Box 1380 **Care of Rock Products**

WANTED

A Quarry Foreman capable of handling large Quarry operation involving the use of steam shovels, dragline, etc. Want a man who is thoroughly capable of handling men, supervising track work and getting results. In applying, state age, experience and salary expected. Address

Box 1374 **Care of Rock Products**

WANTED

Practical quarry man, with some capital, to take the quarry end of a good proposition. Quarry is located two miles from Milwaukee. Address

Box 1377 **Care of Rock Products**

Help Wanted

WANTED

A man to make lime on a commission basis. Must understand the business thoroughly—limestone, quarrying, lime burning and hydrating. Apply

C. A. TIMMONS
233 Sorauren Avenue, Toronto, Ont., Canada

WANTED

An experienced quarry foreman familiar with operation of steam shovels and large crushers. Permanent position for right party. State experience and furnish reference. Advise salary expected. Address

Box 1362 **Care of Rock Products**

Want to communicate with drill man capable running well drill in quarry having 50′ face. Address

Box 1382, Care of Rock Products

Plants For Sale

FOR SALE

Lime, sand and gravel and sand-lime brick plant; fully developed; excellent opportunity for crushed limestone business also; 50 acres in fee. Very low price; a 20% plus investment. Exclusive territory for output. For full particulars write

G. N. WYCKOFF
DUDLEY, KY.

FOR SALE

Rich grey lime quarry and lime-making and hydrating plant complete. Easy to work. Trade already established. Convenient to large market.

C. A. TIMMONS
233 Sorauren Avenue, Toronto, Ont., Canada

FOR SALE

85 acre lime property, 98%. 50 ft. breast. 1 limekiln, 5-room stone house and other buildings. ¼ mile lake front on Lake Chelan, the most beautiful lake in the Northwest. Great building activity this year. $30,000.

K. B. WUELFINGEN
Lakeside, Wash.

You are reading this ad. So are others. That is why it will pay you to advertise in these columns.

Situation Wanted

POSITION WANTED

Young man, single, technical education, with eight years' practical experience in stone plants and stone quarries, wants to secure position with up-to-date and well-financed quarry operating firm. The writer has had five years' experience in the capacity of superintendent and general superintendent of plants; has purchased, set up and operated all kinds of crushing machinery and equipment, and has handled large forces of American and foreign laborers. Has installed and supervised cost accounting systems, and has succeeded in reducing mechanical breakdowns and in operating plants efficiently. Will appreciate an interview and can furnish satisfactory references and recommendations. Address

Box 1364 **Care of Rock Products**

POSITION WANTED

By general quarry superintendent or manager, with 18 years' experience constructing and operating crushing plants, handling all styles drilling machines, successfully blasting in various formations. Have never had a strike or business tied up in any respect. Would take full charge of operation. Flux proposition preferred.

Address
Box 1376, care of Rock Products

SITUATION WANTED

Superintendent desires engagement where thorough knowledge of operation is essential for economical production; thorough knowledge of heavy blasting and efficient upkeep of machinery. References. Address

Box 1351 **Care of Rock Products**

General Manager or Supt.

Desires a change and will accept engagement where careful and efficient operation is essential to increased production and reduction in costs. Familiar with all lines of equipment best adapted to local conditions. Best of references. Address

Box 1378 **Care of Rock Products**

¶ What you don't want someone else wants. And what you need someone else has to sell.

¶ State your needs or what you have to sell—in these columns. They pay!

The Fuller Engineering Co.

Designing, Constructing and Operating Engineers

Analytical Chemists

Cement and Hydrated Lime Plants a Specialty

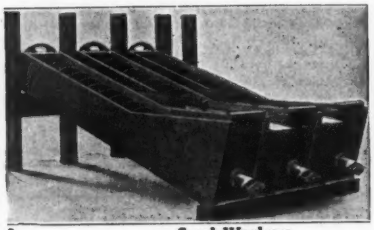
Offices: Allentown National Bank Building
ALLENTOWN, PENNSYLVANIA

EASTON CARS

Scoop cars—to dump at both ends and also at both sides. Ask for specification No. 4. Whatever car suits your need best—we've made it for twenty-five years.

EASTON CAR & CONS'T'N CO.

49 Dey Street, New York — Works: Easton, Pa.
Boston Chicago Detroit Philadelphia Pittsburgh



Sand Washers

9-Foot Dry Pan

Lewistown Foundry & Machine Co.

LEWISTOWN, PA.

Builders of heavy duty crushers and glass sand machinery. Glass sand plants equipped complete.

Write for prices and catalog

SCREENS of All Kinds

Chicago Perforating Co.
2445 West 24th Place
Tel. Canal 1459 CHICAGO, ILL.

We Design and Equip Complete Plants

for the manufacture of gypsum products, such as wall plaster, moulding plaster, wall board products, gypsum block products, also mixing plants.

We are prepared to furnish complete machinery-equipment and design and furnish plans for the installation. Consult our Engineering Department. Forty years' experience in designing of wall plaster machinery and plants.

The J. B. Ehrsam & Sons Mfg. Co.
Engineers, Machinists and Founders
Enterprise, Kansas

BROWNING LOCOMOTIVE CRANES

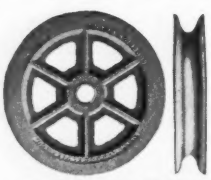
"The All-Around Champions"

BROWNING
"Buckets That Bite"

Both are time and money savers

Write for Catalogs

THE BROWNING CO.
Cleveland, Ohio
Sales Offices:
New York Chicago



STOP

THE INTERRUPTION
→ INCREASE ←
THE PRODUCTION
of Your Plant By Installing

SUPERIOR NON-ROP-WER SHEAVES

They reduce rope wear to a minimum. Save power and insure safety. *Increases Hoisting Efficiency.* They cost no more than ordinary sheaves. Write for booklet today.

Mayer-Hasseldiek Mfg. Co.
Main, Wash and Commercial Sts. St. Louis, Mo.

The Baldwin Locomotive Works

Philadelphia, Pa.

Steam and Gasoline
LOCOMOTIVES
for
Industrial Service

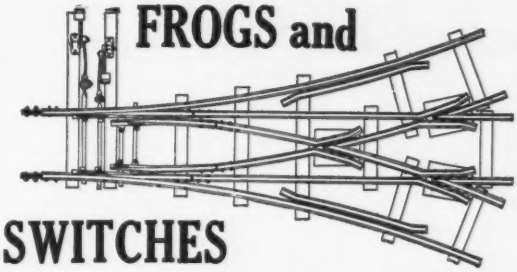
SAUERMAN
DRAGLINE CABLEWAY EXCAVATORS

IF you want to study the advantages of the dragline cableway excavator method of handling gravel from pit to plant in one operation, doing away with intermediate conveying equipment,

Write for Our Catalog

Sauerman Bros., 1140 Monadnock Blk., Chicago

dig convey elevate & dump in one continuous movement under complete control of one man



FROGS and SWITCHES

The Central Frog & Switch Co., Cincinnati, O.

Frogs, Switches, Crossings, Switch Stands, Rails, Angle Bars, Fishplates, Throws, Rail Braces, Tie Plates, Portable Track, Etc., Etc.

PORTER LOCOMOTIVES
STEAM & COMPRESSED AIR
WRITE FOR CATALOGUE
H.K. PORTER Co.
Pittsburgh, Pa.

Robert W. Hunt Jno. J. Cone Jas. C. Hallsted D. W. McNaugher

ROBERT W. HUNT & CO.
Inspection—Tests—Consultation

Inspection New and Second Hand Machinery, Pumps, Crushers, Steam Shovels, Cars, Locomotives, Rails and Quarry and Contractors' Equipment

INSPECTION AND TESTS OF SAND, GRAVEL, CEMENT, STRUCTURAL STEEL, CASTINGS AND CONSTRUCTION MATERIALS

Cement, Chemical and Physical Testing Laboratories

New York St. Louis CHICAGO Kansas City Cincinnati Pittsburgh San Francisco

The Advance Engineering Company
Cleveland, Ohio
The "ADEN" Crane and Bucket
Special Interest to Sewer Contractors and Special Excavation Problems

E. 140th St. Sewer, Cleveland, O., —3-4 YdH.eavy Bucket being used

American Wire Rope

FOR elevators, dredges, lumbering, mining, oil-well drilling, suspension bridges, stump-pulling, cranes, derricks, ship's rigging and every other form of wire rope use.

Ask for illustrated catalogue

American Steel & Wire Company
Chicago, New York, Cleveland, Pittsburgh, Worcester, Denver
Export Representative: U. S. Steel Products Co., New York
Pacific Coast Representative: U. S. Steel Products Co.
San Francisco Los Angeles Portland Seattle

F. L. SMIDTH & CO.
50 CHURCH STREET NEW YORK

Engineers

CEMENT MANUFACTURING PLANTS
CEMENT MAKING MACHINERY
PULVERIZED COAL INSTALLATIONS
GRANULATING AND PULVERIZING MACHINES FOR ALL MATERIALS
FLINT PEBBLES—SILEX LINING
THE LENIX BELT DRIVE

Robins Conveying Machinery

is handling limestone, clinker, cement in bulk and in bags, gypsum, sand, gravel, crushed stone and many similar materials. Write for a copy of the Robins Handbook of Conveyor Practice and learn more about the Robins System.

Robins Conveying Belt Company
Park Row Bldg. New York City

Chicago, Ill., Old Colony Bldg. Pittsburgh, Pa., Union Arcade Bldg.
San Francisco, Cal. The Griffen Co., Holbrook Bldg. Birmingham, Ala. C. B. Davis Eng. Co., Brown Marx Bldg.
Salt Lake City, Newhouse Building

LOCOMOTIVE CRANES
CLAM SHELL BUCKETS - SHIPBUILDING CRANES
CAR DUMPERS PILE DRIVERS
THE McMYLER INTERSTATE CO.
CLEVELAND OHIO

A CRANE WITH A RECORD FOR SPEED

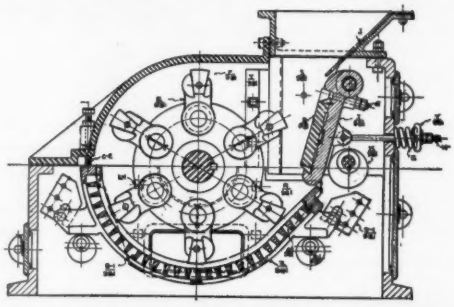
A McMyler Interstate Type "B" Crane, equipped with a McMyler Interstate Clam-Shell Bucket, made a record of 13 trips in 3 minutes, swinging at 90° each trip. The speed is important, but the fact that the crane will stand up under continuous service such as this is more important. The first cost of a crane is of little importance if a large percentage of return is insured. Greater speed, consequent greater capacity, together with low maintenance cost, make the Type "B" one of the best "buys" on the market.

The McMyler Interstate Co., Cleveland, O.

BRANCH OFFICES:

New York—1756 Hudson Terminal Bldg. Seattle ——— Hoge Bldg.
San Francisco—Merchants Exchange Bldg. Denver ——— 18th and Wazee Streets
Chicago ——— 812 Edison Bldg.

THE KENNEDY
Swing-Hammer Pulverizer



A Mechanically Perfect Device

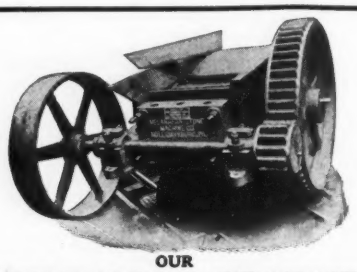
The Kennedy Swing-Hammer Pulverizer embodies mechanical improvements heretofore considered unattainable. Reversible, renewable hammer tips and breaker plates of alloy steel. Impact pulverizing—no grinding movement. Adjustable steel grid—so controlled as to permit adjustment while machine is running. Automatic lubrication. Ball and socket bearings—in short, every possible improvement tending toward efficiency, durability and low maintenance expense.

Send for full description

Kennedy Van Saun Mfg. & Eng. Corp.

"Vickers, Ltd., Vickers House, Westminster, London, England, licensed manufacturers for Great Britain and colonies."

120 Broadway New York



OUR
SINGLE ROLL CRUSHER

is as simple as can be. Is easily fed, makes less fines than either a Gyratory or Jaw. Capacity 5 to 500 tons per hour. For crushing Limestone, Dolomite, Hard Rock Phosphate, Cinders, etc. Screens of all descriptions. Washers for dirty stone.

Ask for Information

McLANAHAN-STONE MACHINE CO., Hollidaysburg, Pa.

Telephone Rector 5575

Pierce J. McAuliffe
CONSULTING ENGINEER

55 Liberty Street, New York City

ANCHOR BRAND COLORS

**For Mortar, Cement and Brick—
Brown, Black, Red and Buff
—Strongest and Most Durable**

Manufactured by

C. K. Williams & Co.

Correspondence Solicited EASTON, PA., U. S. A.

When in the market for machinery or equipment, look through the advertisements of ROCK PRODUCTS. If you do not find what you want advertised in this issue, write us and we will put you in touch with reliable firms who can supply your need. This service is free to our readers. Use it.

Rock Products

The Nation's Business Magazine of the Rock Products Industry

542 So. Dearborn St. Chicago, Illinois

A Highly Efficient
Building Material Handler

It's a 20-Ton, 8-Wheel

OHIO CRANE

Serving a Concrete Mixer

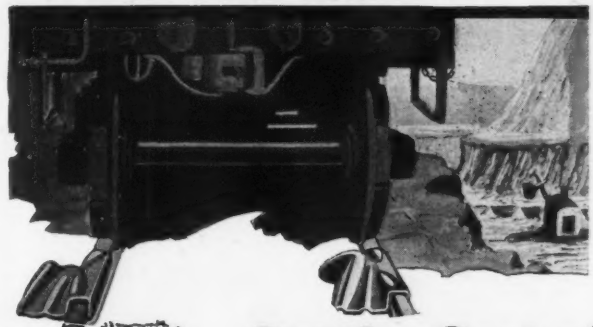
Owner, Arthur McMullen, New York City

Outstanding characteristics of the Ohio Crane are: Simplicity of design—few parts—cut steel gears—bronze interchangeable bearings—all parts strong and large—ease and speed of operation.

Ask Us to Show You an Ohio at Work

OHIO LOCOMOTIVE CRANE CO.

Poplar Street - - BUCYRUS, OHIO



Cut the Cost of Replacement Delays!

Figures speak louder than words. All we ask of you is to compare the expense of holding up loading operations to the cost of being prepared for derailments with

FOWLER
Car Replacers

It's plain as "two and tow is four." The cost is so mush less to be prepared that you can't afford to be without a set another day.

Lay Fowler Pressed Steel Replacers on the track. A tug or push on the "drag" and "bingo!" things are moving. No spikes—no time lost.

Send for Fowler descriptive booklets. Orde" a trial set today. If they fail to suit we will refund purchase price.

Track Equipment Company, Huntington, W. Va.

Osgood-73, in Heavy Quarry Work

THE OSGOOD 73—3½ yard steam shovel is designed throughout for the heaviest kind of service. It meets demands where maximum strength is required and severe work to be done, such as found in iron mines, rock works, etc.

It has all the features in good steam shovel construction which embody steel gears with machine cut teeth; manganese racks and pinions for dipper handle; cast steel swinging circle; heavy front end construction; especially strong boom; large boiler and water tanks; long car frame; enclosed firing platform; steam hoisting friction; by-pass throttle, etc.

We will take pleasure in furnishing you on request complete information on any of the different size shovels we build, which range from ¾ to 6 cubic yard capacity

Write today for copy of our New General Catalog C-1

THE OSGOOD COMPANY, Marion, Ohio

CROSS ENGINEERING CO. CARBONDALE, PA. PERFORATED SHEET METALS

PERFORATED STEEL SCREENS

The success of any house supplying repair and renewal parts depends on furnishing what is needed quickly and correctly, and of satisfactory quality.

Sixteen years in the Perforated Metal field have given us the experience, equipment and technical knowledge, and three hundred tons or more of Steel Plates and Sheets enable us to fill rush orders promptly.

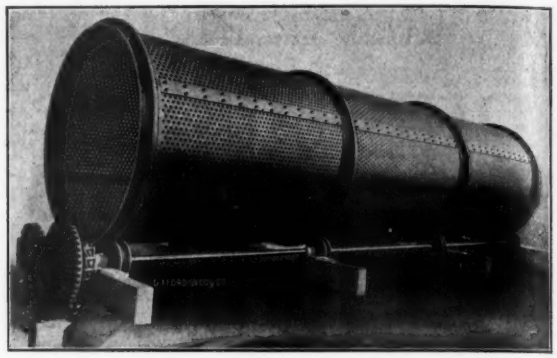
Try us with your next order.

Cross Engineering Company, Offices and Works, Carbondale, Pennsylvania

THE WILLIAMS
2-in-1
CRUSHER

will take Limestone, Lime, Gypsum or Gravel in cubes 14"x16" and under, depending on size of crusher, and in one operation reduce same to 2", 1", 3/4", 1/2", 1/4" or finer. Capacities range from 1 1/2 to 40 tons per hour. Noteworthy features are: Low Horse Power, Slow Speed, High Capacities, Small Floor Space and Instantaneous Adjustment for Different Sized Products. Complete information in Bulletin 4-213.

The Williams Pat. Crusher & Pulverizer Co.
General Sales Dept., 37 W. Van Buren St.
Plant ST. LOUIS — CHICAGO — 67 Second St. SAN FRANCISCO

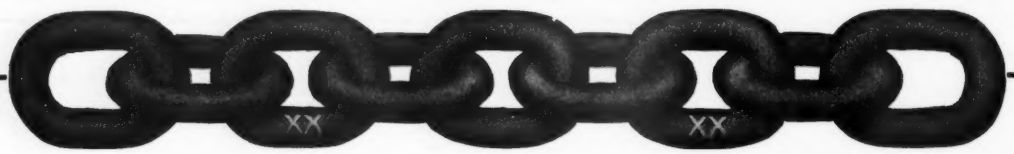


Screens of All Kinds
Also Conveying Machinery
for handling Crushed Stone, Gravel, Sand, Clinker and like materials.

You are invited to ask our cooperation at any time—preferably RIGHT NOW! Just sketch your problem briefly and you shall have a money-saving plan submitted you at once.

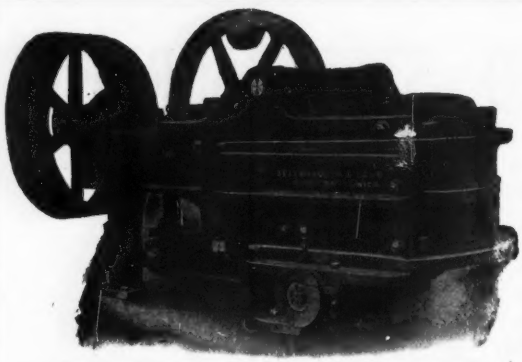
Catalogs mailed on request

Gifford-Wood Co.
HUDSON, N. Y.
New York — Boston — Buffalo — Philadelphia — Chicago



Conveyor, Loading, Steam Shovel, Dredge, Crane, Quarry and Hoisting Chain

UNITED STATES CHAIN & FORGING COMPANY
Union Arcade — *"As Good as the Name"* — Pittsburgh, Pa.



Nippers—17x19", 18x26", 20x30", 24x36" and 26x42"

JAW & ROTARY CRUSHERS

For All Rocks and Ores Softer Than Granite

GYPSUM MACHINERY—We design modern Plaster Mills and make all necessary Machinery, including Kettles, Nippers, Crackers, Buhrs, Screens, Elevators, Shafting, etc.

Special Crusher-Grinders for Lime

Butterworth & Lowe
17 Huron St., Grand Rapids, Mich.

20" to 47" inside diameter. Many variations

GEAR AND FRICTION DRIVEN GASOLINE LOCOMOTIVES—2½ TO 25 TONS ON DRIVE WHEEL

WHITCOMB LOCOMOTIVES

IT WILL PAY YOU TO GET OUR PROPOSITION BEFORE YOU BUY

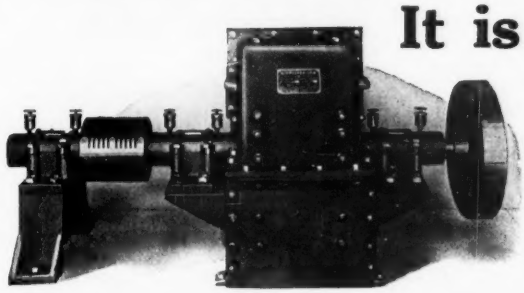
GEO. D. WHITCOMB CO.

MAIN OFFICE AND WORKS

ROCHELLE, ILLINOIS

U. S. A.

STORAGE BATTERY LOCOMOTIVES—1 TO 8 TONS ON DRIVE WHEELS



It is important to note

that whatever you want to crush there's a "K-B" for the job. Let us tell you what the

K-B PULVERIZER

is doing to solve crushing problems similar to your own. Uses less power and built to last.

Ask us for facts and figures.

K-B PULVERIZER COMPANY, Inc., 92 Lafayette St. NEW YORK

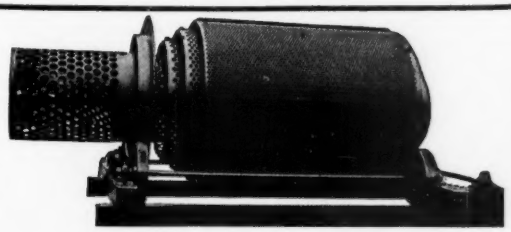
K-B PULVERIZER

Stone Screen Sections

CYLINDERS

DUST JACKETS

Made to Fit All Makes and Sizes of Revolving Screens



The O'Laughlin Screen (Patented)

Sand and Gravel Screens

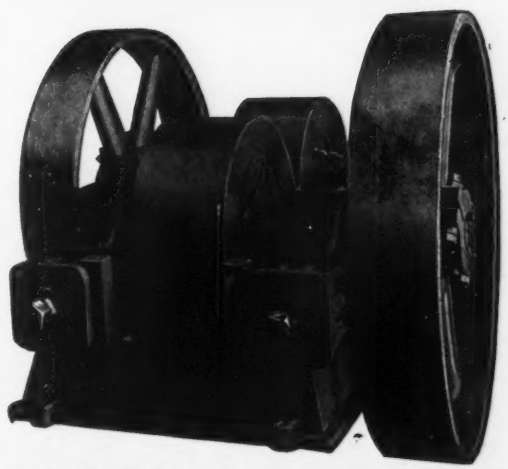
CYLINDERS SCREEN PLATES

CONICAL SCREENS

EVERYTHING IN SCREENS

QUICK SHIPMENTS

Johnston & Chapman Co., 2921 Carroll Ave. CHICAGO



TRANSMISSION EQUIPMENT, SCREENS ELEVATOR BUCKETS, CRUSHERS

Write for descriptive literature

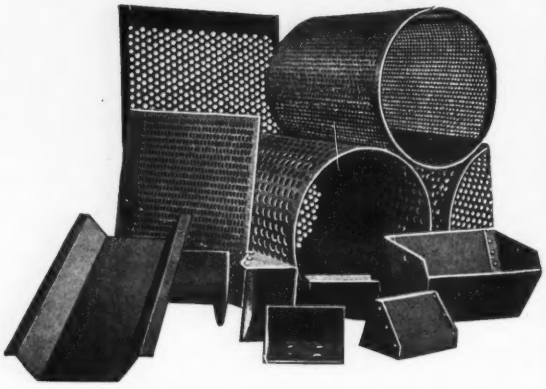
WEBB CITY & CARTERVILLE FOUNDRY & MACHINE WORKS

WEBB CITY, MISSOURI

Perforated Metal Screens

FOR

Stone, Gravel, Sand, Etc.



ELEVATOR BUCKETS

PLAIN AND PERFORATED

General Sheet and Light Structural Work

Hendrick Mfg. Co.

CARBONDALE, PA.

New York Office, 30 Church Street

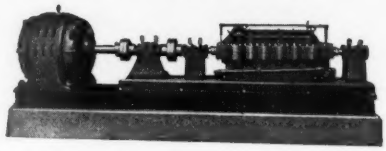
AMERICAN

TRADE MARK REG. U.S. PAT. OFFICE.

CENTRIFUGAL AND DEEP WELL PLUNGER

PUMPS

Service—Dependability and Durability



Built in all practical types and sizes to meet standard requirements for horizontal or vertical centrifugal or deep well plunger pumps. Furnished for direct connection or any desired drive—electric motor, steam, chain, belt or gear.

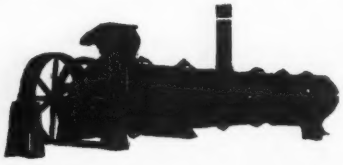
There is half a century of specialization and a rigid guarantee back of every American pump sold.

Catalog 149 describes American Centrifugal Pumps. Catalog 130A describes Deep Well Plunger Pumps. Sent to you on request.

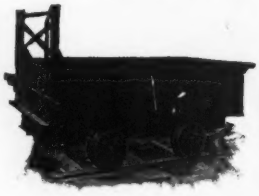
THE AMERICAN WELL WORKS

General Offices and Works: Aurora, Ill.

Chicago Office: First National Bank Building



Lime Hydrators, Kilns, Calcining and Quarry Cars



No. 274
End Dump Quarry Car

No. 217-H Rocker Side Dump Car. ..Also made in end dump. Above car made for loading with Steam Shovel.

Reduce Your Handling Costs by Using

Atlas Cars and Locomotives

Where a trolley wire or third rail is undesirable investigate our storage battery locomotives. Made in several styles and sizes. Cars to suit every requirement.

THE ATLAS CAR & MFG. COMPANY

Ivanhoe Road CLEVELAND, OHIO

Note These Please!

Points of superior merit guarantee economical operation of the Fuller Lehigh

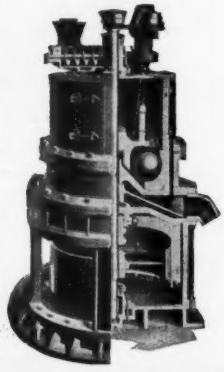
Pulverizer Mill

They are unequalled for producing

Agricultural Limestone

Reduces lump rock to 20, 40, 60, 80, 100 or 200 mesh. Requires no outside accessory equipment. Requires no overhead shafts, drives or screens. All material discharged from mill is finished product. No inside journals or bearings. No inside lubrication. Uniform feeding system. Constant and free discharge. Low installation cost. Low operating cost. Low lubricating cost. Dustless operation. Built in sizes to meet the requirements of your trade. Grinds rock to meet the specifications of all Agricultural Experiment Stations.

Send for Catalog No. 70



Fuller-Lehigh Company

MAIN OFFICE AND WORKS:

Fullerton, Penna., U. S. A.

Branches: New York City, 50 Church St. First National Bank Bldg., Parsons, Kans. 719 Sheldon Building, San Francisco 714 L. C. Smith Building, Seattle, Wash. 1336 McCormick Building, Chicago, Ill. 25 Victoria St., Westminster, S. W. 1., London, England. Germany, Hamburg, 1, "Wallhof," Glockengiesserwall 2.

NATIONAL
Screen Separator

The Leading Screen in

Efficiency
Durability
Simplicity
Capacity

Write for Descriptive Literature to

NATIONAL ENGINEERING COMPANY
549 West Washington Boulevard, Chicago

This ERIE pays for itself every few months in wages saved. Owned by York Hill Trap Rock Quarry Co., Meriden, Conn.

"Replacing 20 to 30 men; Sure of rock every day!"

"With one ERIE Shovel and 18 men, we are now getting the same output which formerly required 40 to 50 men.

"Besides this big saving on our pay-roll, we now have the assurance of a steady output every day.

"After using two ERIE Shovels in hard rock work, we can conscientiously recommend the ERIE." *L. Suzio, Pres., YORK HILL TRAP ROCK QUARRY CO., Meriden, Conn.*

The ERIE Shovel gives steady service in rock work. It is built far stronger than the usual standard of steam-shovel construction.

Even in a quarry which employs only 15 to 20 men, a good steam-shovel will usually save money. It's worth your while to figure this carefully.

We would like to send you our latest Bulletin on steam-shovel work—write for a copy of Bulletin P.

BALL ENGINE CO., Erie, Pa.
Builders of ERIE Steam-Shovels and Cranes, BALL Engines

ERIE Revolving Shovels BALL Engine Co. Erie, Pa.

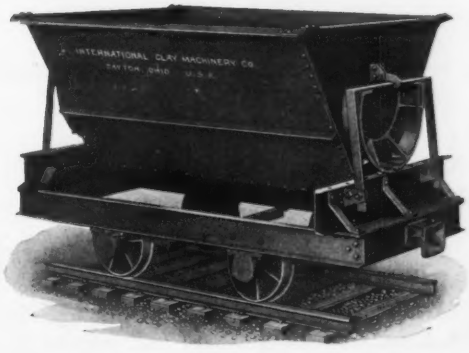
174RP

Universal Crushers

The biggest value for your money. Universal crushers and pulverizers reduce stone to desired size or fineness in a jiffy!
Fifteen years of designing and building experience have made possible the exceptional ability of Universals.

Universal Crusher Co.
225 Third Street
Cedar Rapids, Iowa, U.S.A.

Ask for Folder 1918



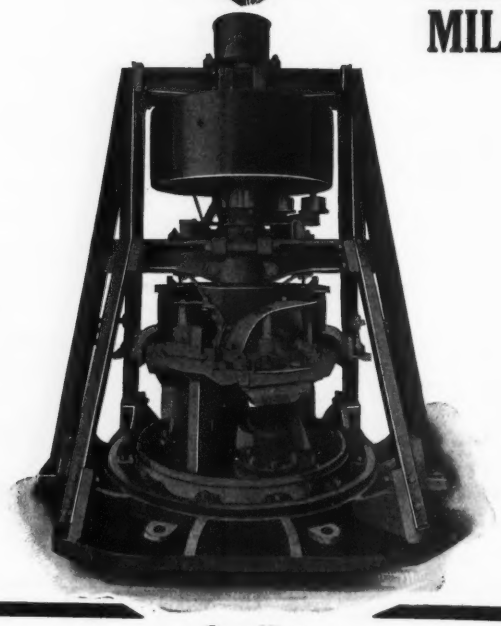
Industrial Cars
OF ALL TYPES

Portable Trackage
Standard or Built to Your Specifications

International Clay Mach. Co.
1051 Bohlender Ave. Dayton, Ohio

BRADLEY

THREE ROLL MILL



Open View

YOUR best opportunity to increase the products of the land by providing agricultural limestone is obtained by installing the BRADLEY THREE ROLL MILL, which produces a perfect limestone powder **most economically.** It takes ¾ inch material (or smaller) and reduces it to a uniform, finely ground material in one operation. This result is accomplished at a **lower price** than is obtained by many mills which turn out **coarser material.**

We will send full particulars and prices. Our engineers are at your service. Engineering of Agricultural Limestone Plants a Specialty.

Bradley Pulverizer Co.

Boston **London, England**

Works: ALLENTOWN, PA.

J.C. BUCKBEE CO.

Engineers

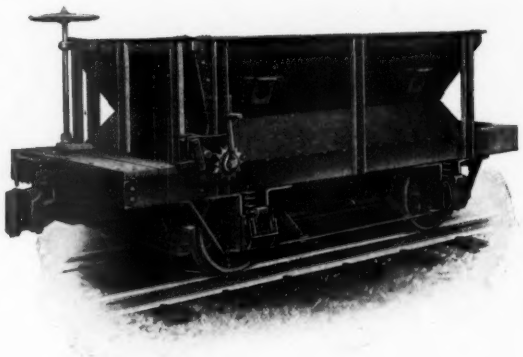
First National Bank Building
CHICAGO

We solicit inquiries from those who contemplate constructing complete cement, crushed stone, agricultural stone, lime burning and gravel plants, or remodeling their present installations.

What we have done in putting other plants on an efficient, paying basis we can do for yours. Details are ready for your consideration.

Examinations, appraisals and reports made for purposes of finance and income tax returns.

We are prepared to finance meritorious properties.



No. 138-R

WATT CARS

We have devoted years to the study of cars for your requirements, and now offer free our engineers' expert judgment in solving your problems.

CARS—every type—that's all we make.

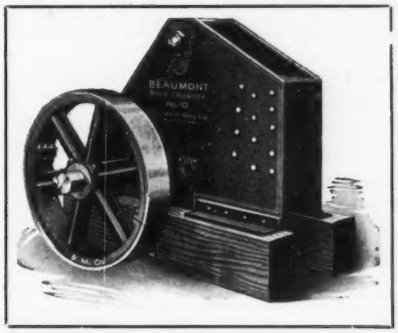
The Watt Mining Car Wheel Co.
Barnesville, Ohio

THE BEAUMONT ROCK CRUSHER

The Most Efficient Machine for Crushing Rock for Road Construction

REASONS WHY:

1. Its design is standard, the best crusher practice being incorporated in the final pattern.
2. Its cam shaft gives two strokes to one of the ordinary crusher, thus producing the same tonnage at half the speed. This reduces friction and wear.
3. Its frame is durable, formed of two massive rolled steel plates.



4. Its wearing plates are reversible four times, thus protecting crushers from wear.
5. Its jaw is constructed of cast open hearth steel, furnished with replaceable bushing interchangeable with lever bushing.
6. Its lever has replaceable bushing and is made of cast open hearth steel.
7. Its shafts are drop forged, made of high carbon steel.

For further information get our catalog 42.

BEAUMONT MFG. CO., 326 Arch Street, Philadelphia, Pa.

Southern Representative: B. C. Scott, Charlotte, N. C.

New York City, 50 Church Street. Pittsburgh, Bessemer Bldg. San Francisco, 461 Market St. Middle Western: Machinery Sales Co., Old Colony Bldg., Chicago.

The Business Side of Locomotive Building

VULCAN Locomotives are not built or sold on the basis of price competition. They are built on a PERFORMANCE basis.

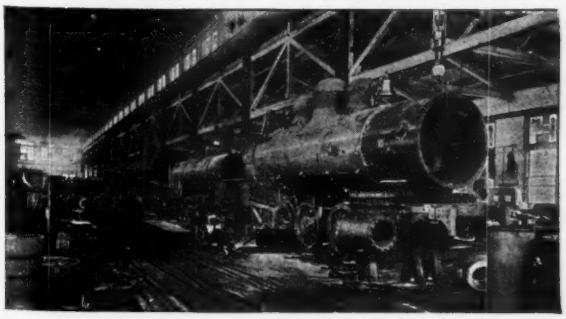
It is not alone that we have been building locomotives for more than 45 years and wish to maintain the prestige we have earned, but also because we realize that economical transportation for you means an engine of correct design, plus a minimum of repair bills and maintenance charges.

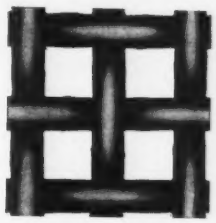
These are the things you buy in a VULCAN Locomotive. Your problems are our problems. Correspondence Solicited

VULCAN IRON WORKS

Designers and Builders of Locomotives for 48 Years

1753 Main Street Wilkes-Barre, Pa.





The New Jersey Wire Cloth Co.

CAN MEET YOUR REQUIREMENTS FOR PLAIN, SINGLE CRIMPED, OR DOUBLE CRIMPED WIRE CLOTH AND SCREENING.

WE MAKE WIRE CLOTH FOR ALL PURPOSES —OF PLAIN STEEL, STEEL GALVANIZED, BRASS, COPPER, PHOSPHOR BRONZE, MONEL, AND OTHER METALS.

ALL JERSEY WIRE CLOTH IS MADE OF ACCURATE GAUGE WIRE AND WOVEN TRUE TO MESH.

A LARGE STOCK OF VARIOUS SIZES CARRIED AT OUR WORKS AND STORES. WE CAN ALSO MAKE TO ORDER ANY SPECIAL WIRE CLOTH YOU MAY REQUIRE.

MAIN OFFICE

616 SO. BROAD ST., TRENTON, N. J.

OFFICES AND STORES

NEW YORK, 210 FULTON ST.

PHILADELPHIA Near Hudson Terminal **BOSTON**

223-27 ARCH ST. **93-95 PEARL ST.**

ROEBLING, N. J. — WORKS — PHILADELPHIA

AUDUBON WIRE CLOTH CO. Inc.

Quality, Service, Satisfaction *Guaranteed*

by manufacturers who know how—as we have specialized in our facilities and equipment for caring for the special requirements of industrial users of wire cloth in the full technical meaning of your requirements.

Can you appreciate this statement?

Therefore it will pay you to get

OUR SERVICE
OUR PRODUCTS
OUR DELIVERIES
OUR PRICES
which demands
YOUR SATISFACTION
QUALITY, EFFICIENCY
AND UNIFORMNESS
OF YOUR PRODUCT

LET US CO-OPERATE WITH YOU

Audubon Wire Cloth Co., Inc.

Manufacturers of

Wire Cloth and Screening in all sizes and meshes, made of Iron, Steel, Brass, Copper, Galvanized and Special Metals. Rock, Crushed Stone, Sand and Ore Screens. All grades Sieves and Riddles. Factory and General Offices—

AUDUBON, N. J.

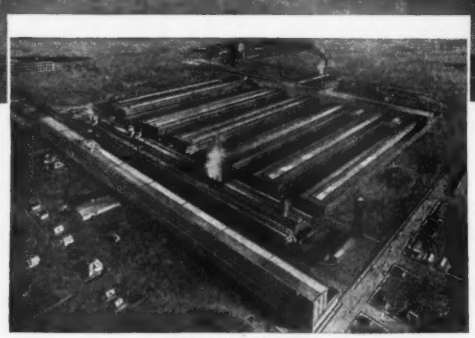
4 Miles from Philadelphia, Pa.

AUDUBON, N. J.

Allis-Chalmers

Equipment

THINK of this enormous plant you can enlist you in to aid problems your



West Allis Works

The Allis-Chalmers organization is essentially a corps of specialists who stand ready to design and equip all or any part of a Stone Crushing, Gravel Washing and Cement Plant.

ALLIS-CHALMERS MFG. CO.

MILWAUKEE, WIS.

Offices in all principal cities

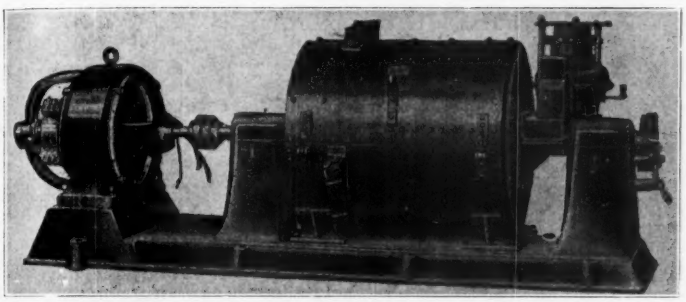
"From First To Last—Allis-Chalmers Equipment"

ABSOLUTE SAFETY IN BURNING PULVERIZED COAL

By the Aero System there is no coal pulverized except for instant use. As conditions call for the supply so does the Aero produce the proper quantity. The hazard attendant upon storage of the coal powder is entirely eliminated.

There is nothing between the coal bunker and the furnace except the Aero, its motor and a plain pipe connection. Another feature with the Aero—if the coal supply is sheltered from rain and snow no artificial drying is necessary. Neither must the coal be of a very high grade—low cost slack coal can be made to yield its last B. T. U.

The AERO PULVERIZER

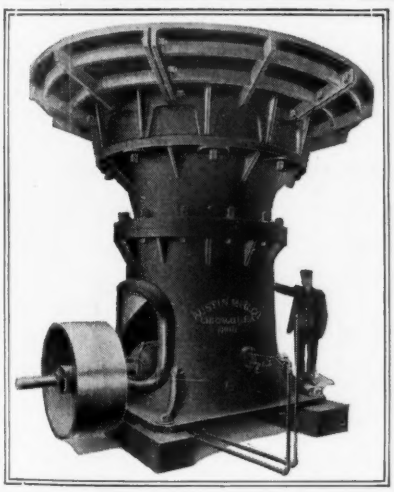


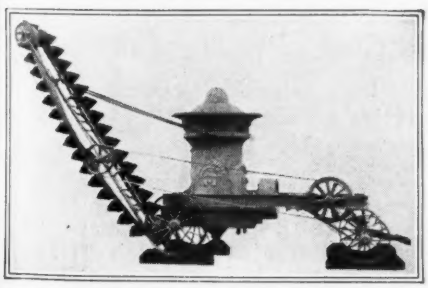
is designed as a complete unit for one furnace. They are built in five standard sizes ranging in capacity from 600 lbs. to 5,000 lbs. of coal per hour. Dust-proof and strongly built. All parts susceptible to wear are easy of access.

BACKED BY THE LONGEST SUCCESSFUL SERVICE

Write for Bulletin

AERO PULVERIZER CO., 120 BROADWAY, NEW YORK





AUSTIN

Gyratory Rock and Ore Crushers

There are six features—real points of superiority, not just talking points—found only on Austin crushers. They are:

1. **Automatic oiling system.**
2. **Rigid eccentric bearing.**
3. **Size of rock handled not affected by adjusting for wear of head and concaves.**
4. **Countershaft supported on each side of driving pinion.**
5. **Full eccentric bearing surface retained when head is raised.**
6. **Thoroly protected from dust and grit.**

There is a wide range of sizes with capacities from 5 to 600 tons per hour.

Write for catalog and detailed information

Austin Manufacturing Company

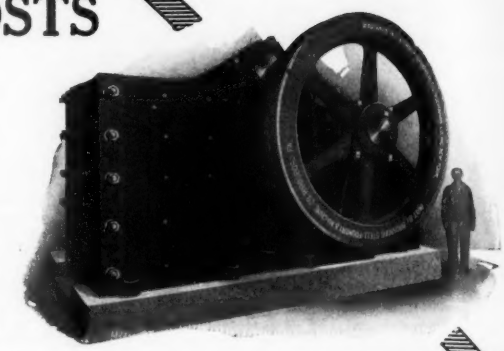
New York CHICAGO San Francisco

CANADIAN AGENTS:

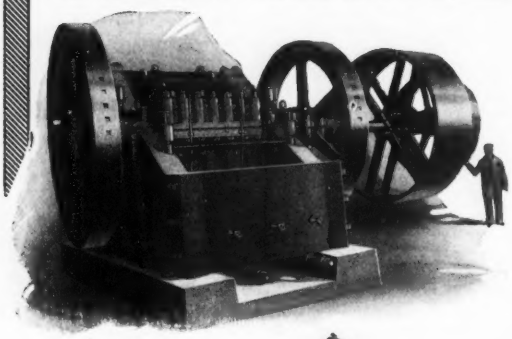
Mussens, Limited, Montreal, Toronto, Winnipeg, Vancouver

REDUCE CRUSHING COSTS

with a Buchanan. They are simply constructed, yet are massive and rugged. Effect the most dependable efficiency possible and the greatest saving in cost of producing.



BUCHANAN ALL STEEL JAW CRUSHERS



The figures show two general designs built for preliminary crushing. Made in standard sizes 60x84″, 48x72″, 48x60″, 42x72″, 42x60″, and 42x54″.

On the hardest rock or ore these machines will make a six-to-one reduction. That is, the size 60x84″ will receive rock measuring approximately 60″ in thickness and will reduce same to 10″ and under, with the usual amount of fine material. The other sizes reduce in the same ratio, according to their respective sizes, and the quality of material.

Let us help you arrive at the best size and type of Buchanan Crusher for your work—24 sizes, from 66x84″ to 24x36″.

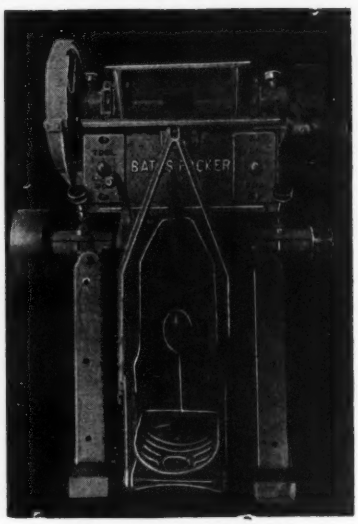
We will send catalogs. Write us.

C. G. BUCHANAN CO., Inc.

90 West Street **New York**

Crushing Machinery, Crushing Rolls and Magnetic Separators

BATES Bag Filling Machine



Single Tube Model

UNEXCELLED for packing pulverized limestone, ground phosphate, gypsum, stucco, cement, Fuller's earth, paint fillers and other pulverized rock products.

Reduction in the cost of filling bags—that's what Bates Bag Filling Machines will accomplish for you. That's why they're used almost exclusively the country over.

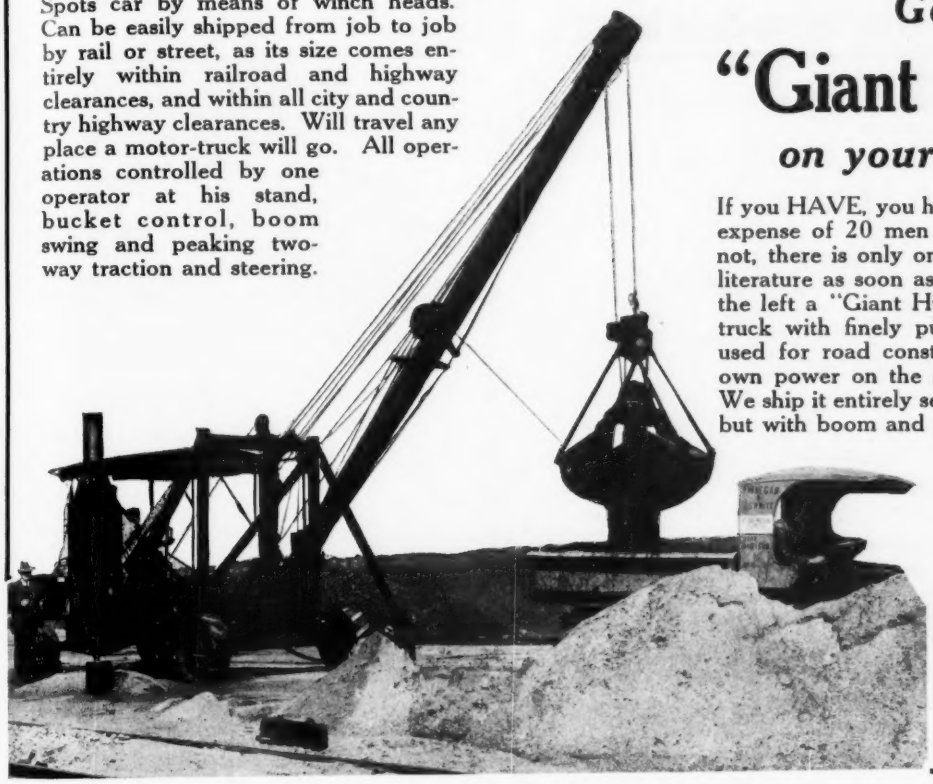
Less Labor—Greater Output—Reduced Cost

Made in four sizes—single tube, two tube, three tube and four tube—respective capacities are 75, 150, 225 and 300 ton per day. Get Catalog.

BATES VALVE BAG COMPANY

7310 South Chicago Ave. **CHICAGO, ILL.**

Spots car by means of winch heads. Can be easily shipped from job to job by rail or street, as its size comes entirely within railroad and highway clearances, and within all city and country highway clearances. Will travel any place a motor-truck will go. All operations controlled by one operator at his stand, bucket control, boom swing and peaking two-way traction and steering.



Got a
"Giant Hunky"
on your payroll?

If you HAVE, you have been able to cut the expense of 20 men or more. If you have not, there is only one remedy—write us for literature as soon as you can. We show at the left a "Giant Hunky" loading a motor-truck with finely pulverized shale dressing used for road constructing. It runs by its own power on the ground—needs no rails. We ship it entirely set up and ready to work, but with boom and wheels removed.

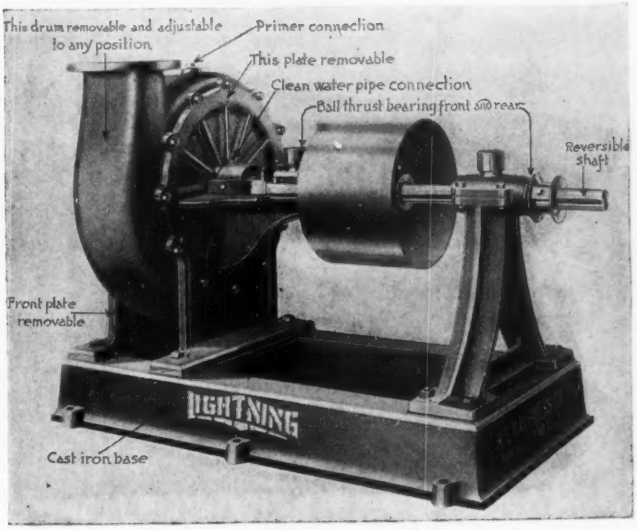
Write for further information

John F. Byers Machine Co.

Steam, Gasoline or Electric Power-Roadwheels or Caterpillars

310 Sycamore St.
RAVENNA, OHIO

The Lightning Sand Pump



The ideal pump for sand companies and contractors—easy to operate, easy to adjust, easy to replace parts.

Write for Prices and Full Information

■

Address Pump Dept.

Kansas City Hay Press & Tractor Co., Kansas City, Mo.

Increase Your Production

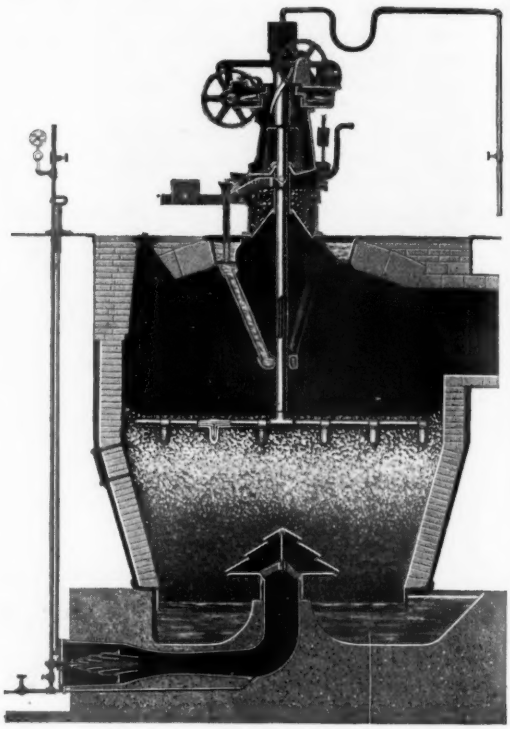
of high grade lime by heating your kilns with producer gas generated in

CHAPMAN Agitator Producers

They deliver a constant supply of high quality gas, thus insuring a uniform temperature in the kiln. This uniform supply of high quality gas burns with a long, clear flame which resembles the flame from a wood fire. The result is a greater production of first grade lime.

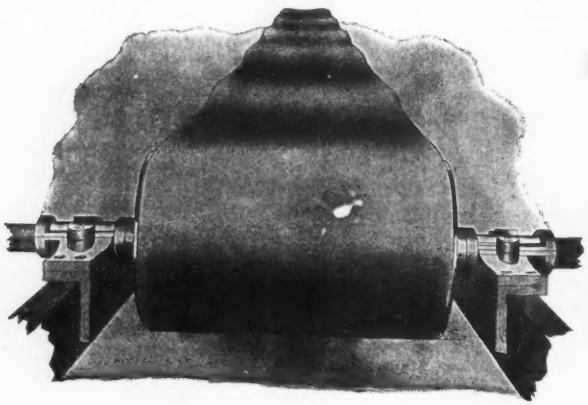
The Chapman Floating Agitator will increase the capacity and the efficiency of hand-poked producers already in operation.

Write us for special information



The Chapman Engineering Company

Oliver Bldg. Pittsburgh — MT. VERNON, OHIO — 11 Broadway New York



"ARNO" CONVEYOR BELTING

Reduces Your Cost of Handling to a Minimum

Arno Conveyor Belts are manufactured to render unusually long and satisfactory service.

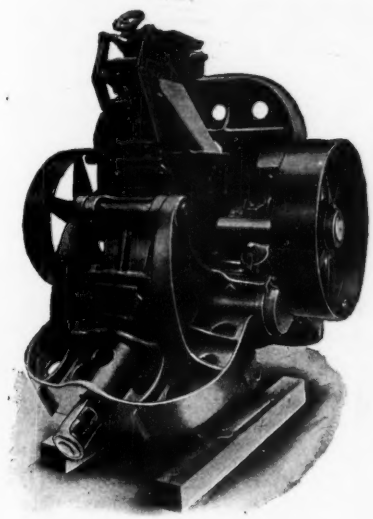
Made of a combination of duck, friction and extra cover stock, they are especially constructed for carrying ores, broken stone, sand, gravel, etc.

Write for Catalog and Information

CINCINNATI RUBBER MANUFACTURING CO.

Makers of Belting—Hose—Packings and Molded Specialties

CINCINNATI, OHIO, U. S. A.



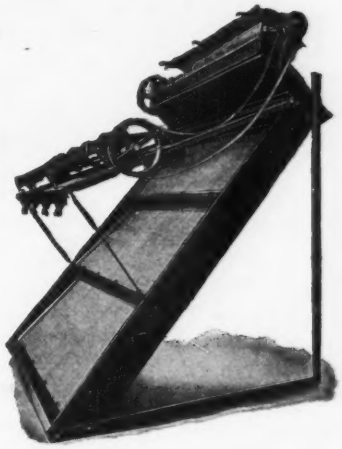
MAXECON MILL

Preliminary Grinder for Tube Mills

LIMESTONE ..... 20 to 40 Mesh
CEMENT CLINKER ..... 20 to 60 Mesh

MAXECON MILL
PERFECTION SEPARATOR

The UNIT that has LARGER OUTPUT with LESS POWER WEAR and ATTENTION than any other.



It will be to the interest of those who operate CEMENT PLANTS to know what the Maxecon Unit will do.

Drop us a line **We will be glad to tell you about it**

Kent Mill Company

10 Rapelyea Street **BROOKLYN, N. Y.**

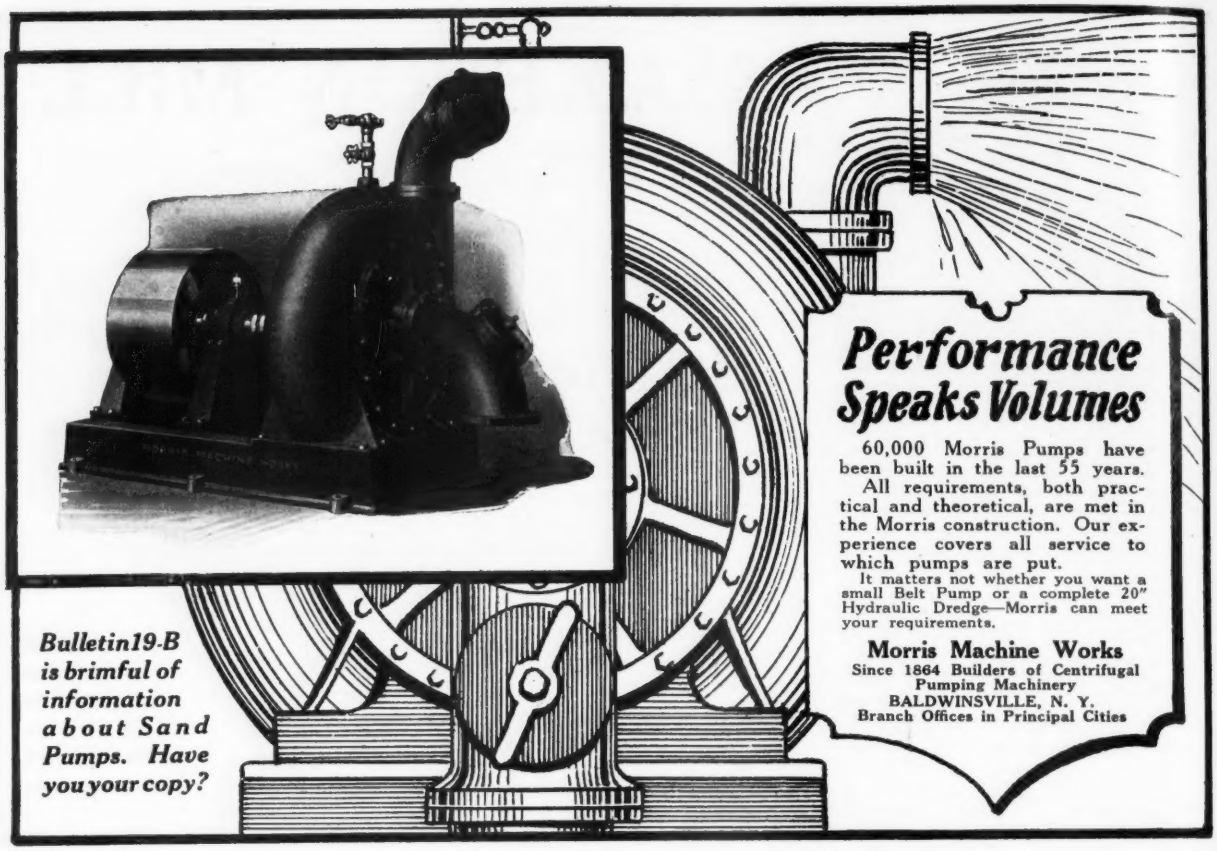
USE

Cordeau-Bickford
Detonating Fuse

For well drill blasting and the tunnel and pocket method of blasting, where large quantities of explosive are to be detonated, use safe, efficient Cordeau-Bickford and get lower blasting costs.

The Ensign-Bickford Co., Simsbury, Conn.

Established 1836 **Original Makers of Safety Fuse**



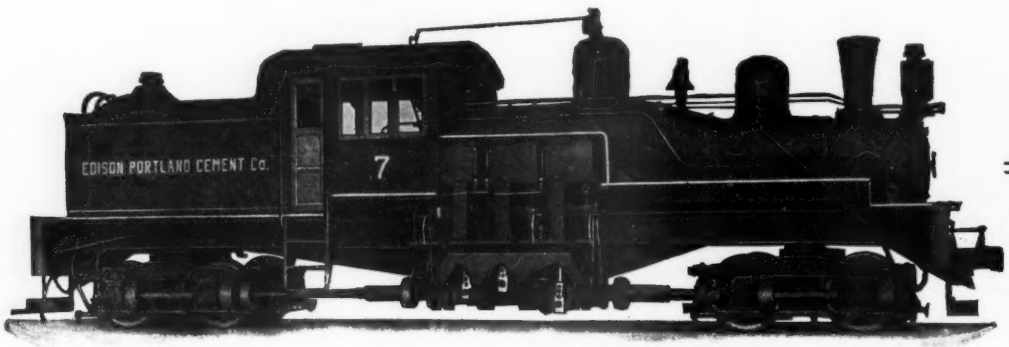
Bulletin19-B is brimful of information about Sand Pumps. Have you your copy?

Performance Speaks Volumes

60,000 Morris Pumps have been built in the last 55 years. All requirements, both practical and theoretical, are met in the Morris construction. Our experience covers all service to which pumps are put.

It matters not whether you want a small Belt Pump or a complete 20" Hydraulic Dredge—Morris can meet your requirements.

Morris Machine Works
Since 1864 Builders of Centrifugal Pumping Machinery
BALDWINSVILLE, N. Y.
Branch Offices in Principal Cities



60-TON SHAY ENGINE BUILT BY LIMA FOR EDISON PORTLAND CEMENT CO.

Steady Output

Each wearing part of a "Shay" is made adjustable for easy maintenance.

In case a wearing part eventually needs replacing, it can be quickly furnished and easily applied without special tools.

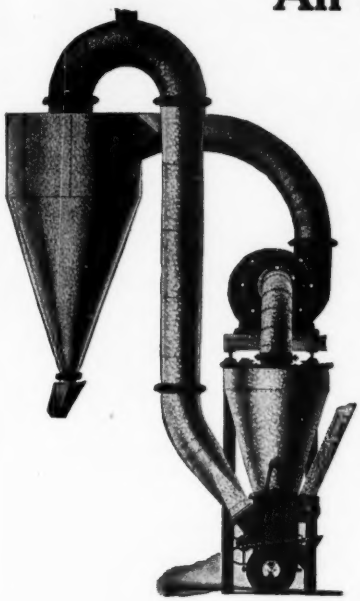
"Shays" work day after day without interruption.

They have a flexible geared drive that makes every wheel a driver.

"Shays" give steady output from Gravel Pit or Quarry.

LIMA LOCOMOTIVE WORKS, Inc.
LIMA, OHIO **30 Church St., New York**

Producing a Pure Hydrated Lime that Doesn't Blister on the Walls Is the Ultimate Object of All Lime Manufacturers



There is only one sure and economical method to do this and that is by using the

RAYMOND PULVERIZING AIR-SEPARATING SYSTEM

With the Raymond System, you get all of your handling machinery, from Hydrator to finished product, in one. It takes the Hydrate direct from the Hydrator; eliminates such impurities as core, sand, and unburned lime, automatically; air separates the product, producing uniform material; and delivers it to a storage bin from which it is bagged.

Consider the total first cost, operating cost and troubles you have with your present grinding and screening equipment against one unit which handles your material from Hydrator to bins.

Then write us for information about the Raymond System, which has become the standard in many lime plants.

Raymond Bros. Impact Pulverizer Company

Western Office:
201 Boston Bldg., Denver, Colo.

1301 North Branch St, Chicago, Ill.

The Clyde Lime Hydrator Performance Counts

The Clyde was first in the field, and through dependable and economical performance is still first choice of lime operators.

The Clyde Hydrator produces big capacities of lime at only three-fifths the cost of any other hydrator on the market.

The Clyde not only produces over 90% of the hydrate of America, but makes the best quality of finishing lime from either high calcium or magnesium.

Simple, easiest to operate, and most economical in cost of installing, maintaining and operating.

Send for Catalog

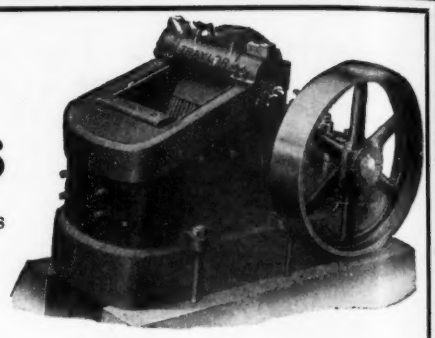
H. MISCAMPBELL

Patentee and Sole Manufacturer

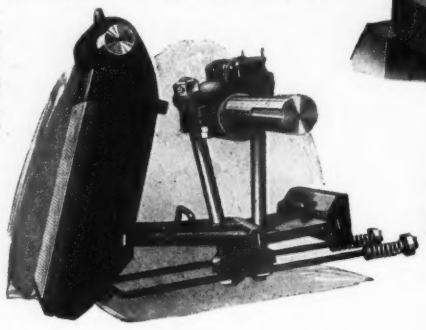
DULUTH - - MINNESOTA

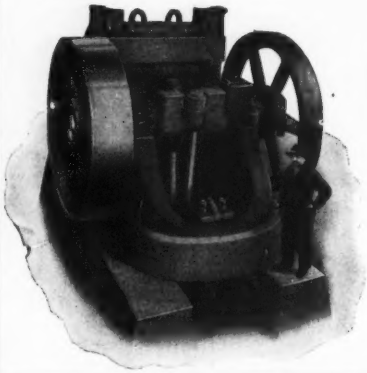
The "Inside Facts" of

Traylor "Bulldog" Jaw Crushers



The lighter but far stronger pitman and the frictionless toggle system represent a tremendous advance in jaw crusher design; 80 per cent of the usual friction load is eliminated by this feature alone—a saving that will effect big economies in your crushing.





Bulletin RJX-1

fully describes the many "Bulldog" economies.

Write for your copy.

Traylor Engineering & Mfg. Co.

ALLENTOWN, PA.

New York, 30 Church St. — Pittsburgh, 211 Fulton Bldg.

Chicago, 1414 Fisher Bldg. — Los Angeles, Citizens Bank Bldg. — Spokane, Mohawk Block

SCHAFFER
Continuous Lime Hydrators

AUTOMATIC operation delivers lime by **weight,** not volume, to the Schaffer Hydrator. Automatically, water, too, is added in correct proportion—insuring a continuous flow of a superior product.

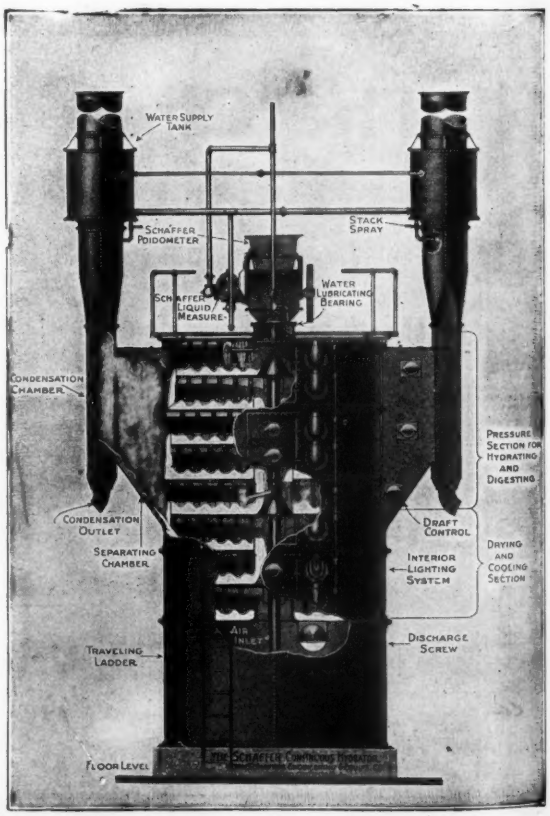
The flexibility of control enables the use of either high calcium or dolomite lime, while at the same time the automatic operation of Schaffer Hydrators solves the labor problem, as they require but little attention.

Our literature on the Schaffer Hydrator covers all the questions you now have in mind. Write for it at once!

Schaffer Engineering & Equipment Co.

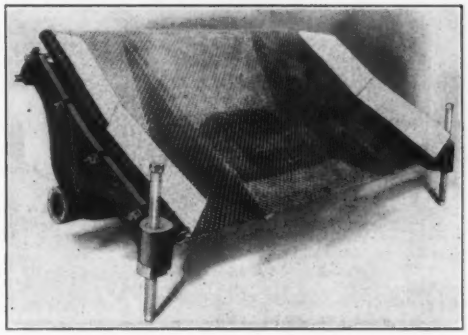
James Bldg., Chattanooga, Tenn.

Peoples Bank Bldg., PITTSBURGH, PA.



The Mitchell Electric Vibrating Screen

Produce 3,600 vibrations of the screen cloth per minute with no racking or straining



Let a Mitchell screen operate with no material passing over it, and you can hardly tell it is in motion. A slight blur of your vision as you regard the screen cloth, and the soft whirr of the motor in the electric vibrator are the only evidences of activity.

Yet every mesh of the screen cloth is being driven along an upward, circular path at the tremendous rate of 3,600 vibrations a minute. And in actual operation, the meshes strike the material with an impact of from 500 to 1,000 pounds.

Such power and rapidity in the movement of the screen cloth mean unequalled tonnages screened with unequalled thoroughness. And the entire absence of racking, jarring or straining make for unequalled economy.

Write us for a full description of the unique, revolutionary construction and operation of the Mitchell Electric Vibrating Screen

Manufacturers and Sole Agents

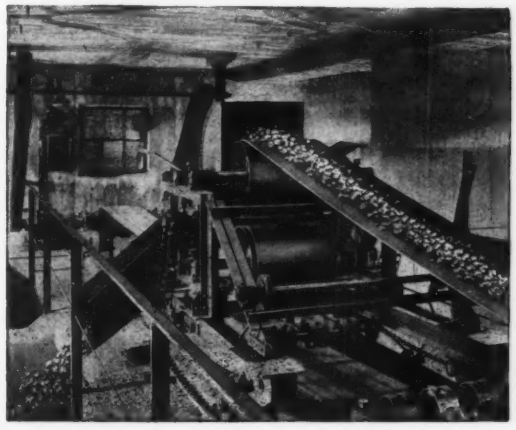
Stimpson Equipment Co.

315 Felt Building Salt Lake City, Utah

Weller

Elevating, Conveying and Power Transmitting Machinery

Helps you run your plant at full capacity with less help, increases production and reduces costs in the handling of Cement, Lime, Brick, Stone Crushing and other Building Material.



Equipment is made to stand the wear and tear required in the handling of heavy material.

Our Engineers are at your service — Submit your problem to us.

WELLER MFG. CO.
CHICAGO

New York Boston **Baltimore Philadelphia** **Houston Salt Lake City**

Buyers' Guide of the Rock Products Industry

AIR COMPRESSORS
Worthington Pump & Mach. Co., New York City.

BAGS AND BAG MACHINERY
Bates Valve Bag Co., Chicago, Ill.
Jaite Company, The, Jaite, Ohio.
Valve Bag Co. of America, Toledo, Ohio.

BELTING
Cincinnati Rubber Mfg. Co., Cincinnati, Ohio.
Goodyear Tire & Rubber Co., Akron, O.
Main Belting Co., Philadelphia, Pa.
New York Belting & Packing Co., New York City.

BIN GATES
Beaumont Mfg. Co., Philadelphia, Pa.
Good Roads Mach. Co., Philadelphia, Pa.

BINS, STORAGE
Preston Co., J. M., Lansing, Mich.
Weller Mfg. Co., Chicago, Ill.

BLASTING SUPPLIES
Aetna Explosives Co., N. Y. City
Atlas Powder Co., Philadelphia, Pa.

BUCKETS, ELEVATOR
Hendrick Mfg. Co., Carbondale, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill.

BUCKETS
Advance Eng. Co., Cleveland, O.
Browning Co., Cleveland, Ohio.
Marion Steam Shovel Co., Marion, Ohio.
McMyler Interstate Co., Cleveland, Ohio.
Owen Bucket Co., Cleveland, Ohio.

CALCINING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Butterworth & Lowe, Grand Rapids, Mich.

CAR REPLACERS
Track Equipment Co., Huntington, W. Va.

CHAINS AND TRANSMITTING MACHINERY
Link-Belt Co., Chicago, Ill.
Stephens-Adamson Mfg. Co., Aurora, Ill.
U. S. Chain & Forging Co., Pittsburgh, Pa.

CHAINS, DREDGE
U. S. Chain & Forging Co., Pittsburgh, Pa.

CLIPS, WIRE ROPE
American Hoist & Derrick Co., St. Paul, Minn.

CONVEYORS AND ELEVATORS
Caldwell, H. W., & Son Co., Chicago, Ill.
Gifford-Wood Co., Hudson, N. Y.
Good Roads Mach. Co., Philadelphia, Pa.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Link Belt Co., Chicago, Ill.
Portable Machinery Co., Passaic, N. J.
Robins Conveying Belt Co., New York City.
Smith Eng. Works, Milwaukee, Wis.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Tiffin, Ohio.
Weller Mfg. Co., Chicago, Ill.

CRANES
Locomotive Gantry
American Hoist & Derrick Co., St. Paul, Minn.
Advance Eng. Co., Cleveland, O.
Ball Engine Co., Erie, Pa.
Browning Co., Cleveland, Ohio.
Byers Mach. Co., John F., Ravenna, Ohio
Chisholm-Moore Mfg. Co., Cleveland, Ohio.
McMyler-Interstate Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Osgood Co., The, Marion, Ohio.

CRUSHERS AND PULVERIZERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulverizer Co., St. Louis, Mo.
Austin Mfg. Co., Chicago, Ill.
Bacon, Earle C., Inc., New York City.
Beaumont Mfg. Co., Philadelphia, Pa.
Buchanan Co., Inc., C. G., New York City.
Bradley Pulverizer Co., Allentown, Pa.
Butterworth & Lowe, Grand Rapids, Mich.
Chalmers & Williams, Chicago Heights, Ill.
Fuller-Lehigh Co., Fullerton, Pa.
Good Roads Mach. Co., Philadelphia, Pa.
Jeffrey Mfg. Co., The, Columbus, Ohio.
K. B. Pulverizer Co., New York City.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.
Kent Mill Co., Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co., Lewistown, Pa.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulverizer Co., Chicago, Ill.
Smidth & Co., F. L., New York City.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Webb City & Carterville F. & M. Works, Webb City, Mo.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.
Worthington Pump & Mach. Corp., New York City

DERRICKS
American Hoist & Derrick Co., St. Paul, Minn.

DRILLS
Sanderson Cyclone Drill Co., Orrville, Ohio.
Wood Drill Works, Paterson, N. J.

DRYERS
American Process Co., New York City.
Ruggles-Coles Eng. Co., N. Y. City.
Vulcan Iron Works, Wilkes-Barre, Pa.

DYNAMITE
Aetna Explosives Co., New York City.
Atlas Powder Co., Philadelphia, Pa.

ENGINES, OIL & GAS
Worthington Pump & Mach. Co., New York City.

ENGINES, STEAM
Morris Mach. Works, Baldwinsville, N. Y.

ENGINEERS
Arnold & Weigel, Woodville, Ohio.
Bacon, Earle C., Inc., New York City.
Bradley Pulv. Co., Allentown, Pa.
Buckbee Co., J. C., Chicago, Ill.
Fuller Engineering Co., Allentown, Pa.
R. W. Hunt & Co., Chicago, Ill.
Smidth & Co., F. L., New York City.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Yates, Preston K., New York City.

EXCAVATORS
Ball Engine Co., Erie, Pa.
The Cable Excavator Co., Philadelphia, Pa.
Marion Steam Shovel Co., Marion, Ind.
Owen Bucket Co., Cleveland, Ohio.

EXCAVATORS
Dragline Cableway
Sauerman Bros., Chicago, Ill.

EXPLOSIVES
Aetna Explosives Co., New York City.
Atlas Powder Co., Philadelphia, Pa.

FIRE BRICK
Robinson Clay Product Co., The, Akron, Ohio.

FUSES
Ensign-Bickford Co., Simsbury, Conn.

GAS PRODUCERS
Chapman Eng. Co., Mt. Vernon, Ohio.
International Clay Mach. Co., Dayton, Ohio.

GEARS
Caldwell, H. W., & Sons Co., Chicago, Ill.
Stephens-Adamson Mfg. Co., Aurora, Ill.

GLASS SAND EQUIPMENT
Lewistown Fdy. & Mach. Co., Lewistown, Pa.

HOISTS
American Hoist & Derrick Co., St. Paul, Minn.
Chisholm-Moore Mfg. Co., Cleveland, Ohio.
Vulcan Iron Works, Wilkes-Barre, Pa.

HOSE
Water, Steam, Air Drill, Pneumatic Tool
Cincinnati Rubber Mfg. Co., Cincinnati, O.
Goodyear Tire & Rubber Co., Akron, O.
N. Y. Belting & Packing Co., New York City.

HYDRATING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

HYDRAULIC DREDGES
Morris Machine Works, Baldwinsville, N. Y.

INDUSTRIAL CARS
Atlas Car & Mfg. Co., Cleveland, Ohio.
Easton Car & Constr. Co., Easton, Pa.
International Clay Machine Co., Dayton, Ohio.
Koppel Indust. Car & Equip. Co., Koppel, Pa.
Watt Mining Car Wheel Co., Barnesville, Ohio.

LIME KILNS
Arnold & Weigel, Woodville, Ohio.
Steacy-Schmidt Mfg. Co., York, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

LOADERS AND UNLOADERS
Ball Engine Co., Erie, Pa.
Gifford-Wood Co., Hudson, N. Y.
Good Roads Mach. Co., Philadelphia, Pa.
International Clay Mach. Co., Dayton, O.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Stephens-Adamson Mfg. Co., Aurora, Ill.

LOCOMOTIVES
Baldwin Locomotive Works, The, Philadelphia, Pa.
Fate-Root-Heath Co., Plymouth, Ohio.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Lima Locomotive Works, New York City.
Porter Co., H. K., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

MANGANESE STEEL
American Mang. Steel Co., Chicago, Ill.

MOTORS, ELECTRIC
Gifford-Wood Co., Hudson, N. Y.

MOTOR TRUCKS
Duplex Truck Co., Lansing, Mich.
Pierce-Arrow Motor Car Co., Buffalo, N. Y.

PACKING
Sheet, Piston, Superheat, Hydraulic
Cincinnati Rubber Mfg. Co., Cincinnati, O.
Goodyear Tire & Rubber Co., Akron, O.
N. Y. Belting & Packing Co., New York City.

PAINT AND COATINGS
Williams, C. K., & Co., Easton, Pa.

PERFORATED METALS
Chicago Perforating Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.
Johnston & Chapman Co., Chicago, Ill.
Nortmann Duffke Co., Milwaukee, Wis.

PLASTER MACHINERY
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J.B., Enterprise, Kan.

PORTABLE CONVEYORS
Stephens-Adamson Mfg. Co., Aurora, Ill.

PORTABLE STONE BINS
Austin Mfg. Co., Chicago, Ill.

PUMPS
American Well Works, Aurora, Ill.
Worthington Pump & Machine Co., N. Y. City.

PUMPS, SAND
American Manganese Steel Co., Chicago, Ill.
K. C. Hay Press & Tractor Co., Kansas City, Mo.
Morris Mach. Works, Baldwinsville, N. Y.

POWER TRANSMITTING MACHINERY
Caldwell, H. W., & Son. Co., Chicago, Ill.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Weller Mfg. Co., Chicago, Ill.

POWDER
Aetna Explosives Co., New York City.
Atlas Powder Co., Philadelphia, Pa.

PULVERIZED FUEL EQUIPMENT
Aero Pulv. Co., New York City.
Bradley Pulv. Co., Allentown, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.

QUARRY EQUIPMENT
Beaumont Mfg. Co., Philadelphia, Pa.
Marion Steam Shovel Co., Marion, O.
Universal Road Mach. Co., Kingston, N. Y.

SCRAPERS, DRAG
Sauerman Bros., Chicago, Ill.

SCREENS
Audubon Wire Cloth Co., Audubon, N. J.
Austin Mfg. Co., Chicago, Ill.
Beaumont Mfg. Co., Philadelphia, Pa.
Cross Eng. Co., Carbondale, Pa.
Gifford-Wood Co., Hudson, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Johnston & Chapman Co., Chicago, Ill.
Link Belt Co., Chicago, Ill.
National Engineering Co., Chicago, Ill.
New Jersey Wire Cloth Co., Trenton, N. J.
Smith Eng. Works, Milwaukee, Wis.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Stimpson Equip. Co., Salt Lake City, Utah.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.

SEPARATORS
National Engineering Co., Chicago, Ill.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.

SEPARATORS, MAGNETIC
Buchanan Co., C. G., Inc., New York City.

SHEAVES
Mayer-Hasseldiek Mfg. Co., St. Louis, Mo.

SHOVELS
Steam and Electric
Ball Engine Co., Erie, Pa.
Bucyrus Company, Milwaukee, Wis.
Marion Steam Shovel Co., Marion, Ohio.
The Osgood Co., Marion, Ohio.
Victor R. Browning & Co., Cleveland, Ohio.

STONE ELEVATORS
Austin Mfg. Co., Chicago, Ill.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Weller Mfg. Co., Chicago, Ill.

TANK CRAWLERS
Victor R. Browning & Co., Cleveland, Ohio.

TRACK EQUIPMENT
Central Switch & Frog Co., Cincinnati, Ohio.
Track Equipment Co., Huntington, W. Va.

VALVES
Goodyear Tire & Rubber Co., Akron, O.

WASHERS, GRAVEL
Smith Eng. Works, Milwaukee, Wis.

WIRE ROPE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.
Roebling's Sons Co., John A., Trenton, N. J.
Waterbury Co., New York City.

WIRE CLOTH
Audubon Wire Cloth Co., Audubon, N. J.
Cleveland Wire Cloth Co., Cleveland, Ohio.
New Jersey Wire Cloth Co., Trenton, N. J.

Here is a real time and money saver. Replace the wheelbarrow with an S-A Unicon.

Built in four lengths—15, 20, 25 and 30 foot centers. Furnished with or without truck. S-A elevating truck furnished when required.

S-A UNICON
UNIT CONVEYOR

S-A UNICON PORTABLE CONVEYOR

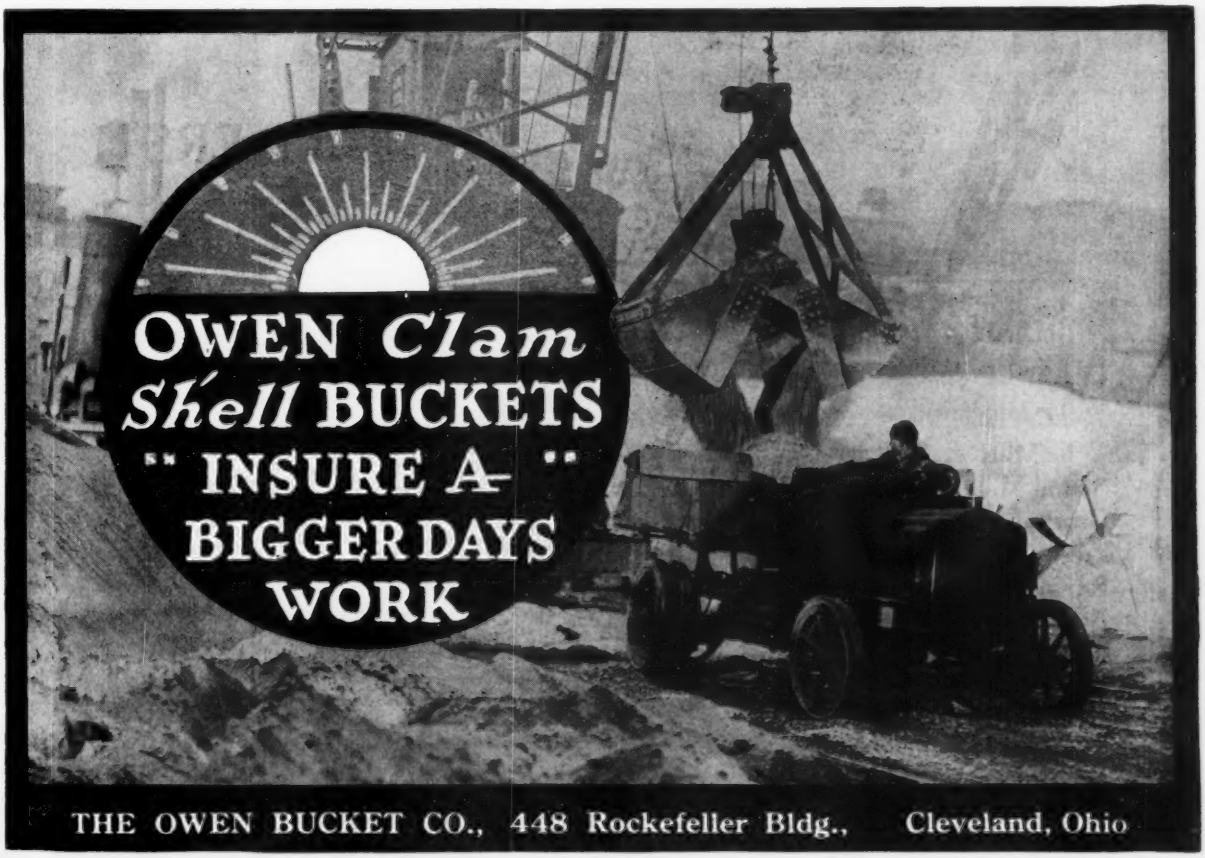
To handle materials for a short distance, quickly and economically, is the function of the S-A Unicon. This conveyor has been designed to be easily portable and thoroughly reliable and dependable in service. The machine is self-contained, the motor and driving mechanism are enclosed and completely protected. Any material which can be conveyed on an 18-inch belt can be handled by the Unicon. All the parts are standard and interchangeable.

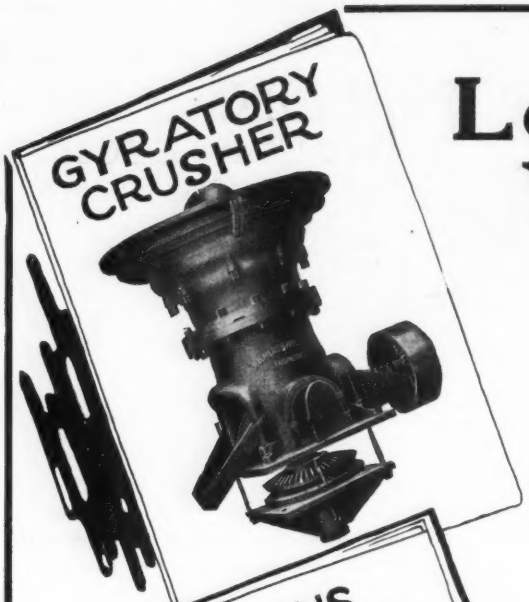
SPECIFICATIONS

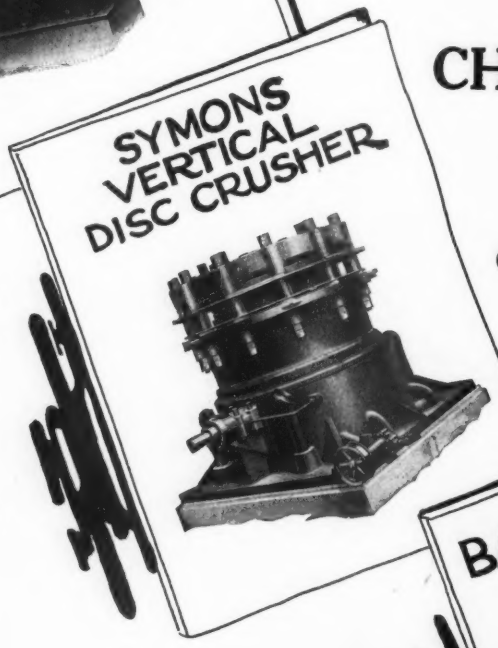
Belt width	18 inches	Frame	Streamline plate girder type
Centers	15, 20, 25 and 30 foot centers	Decking	Plate decking entire length
Width of frame	2 feet 3½ inches	Loading hopper	Removable steel plate hopper
Depth of frame	12 inches	Main bearings	Roller bearing equipped
Belt	High grade conveyor belt	Carriers	Roller bearing equipped

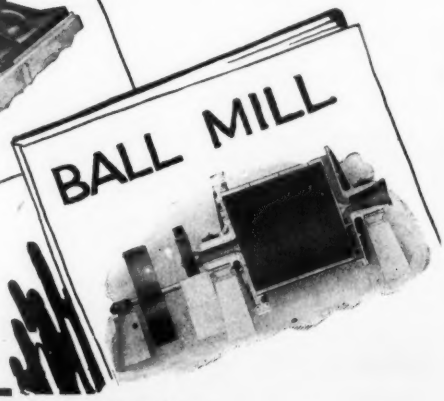
SEND FOR CIRCULAR "U"

STEPHENS-ADAMSON MFG. CO., AURORA, ILL.









Let Us Send You These Catalogues

We would like to have you in this way acquaint yourself with the superior quality of our product; learn just what the machines will accomplish on your product.

If you have not already investigated their advantages, we believe it would be to your advantage to consider our reduction machinery.

CHALMERS *and* **WILLIAMS**

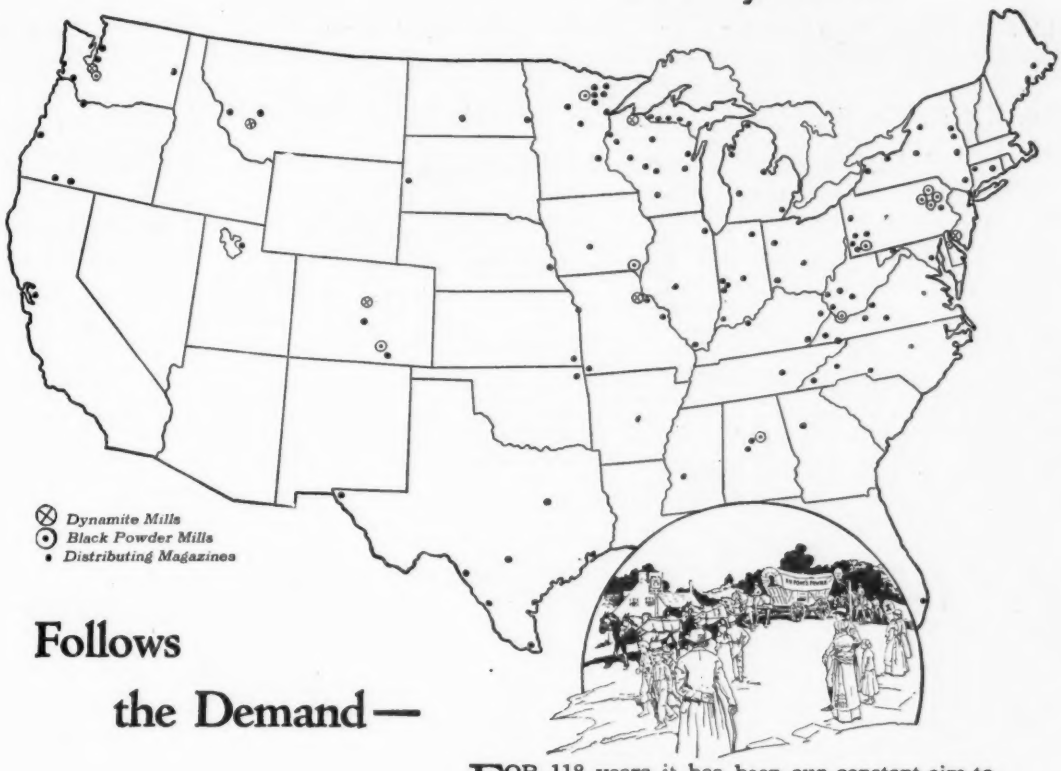
1425 Arnold St.
Chicago Heights, Ill.

Our Other Products

Jaw Crushers
Tube Mills
Stamp Mills
Crushing Rolls
Pulsating Screens
Revolving Screens
Burt Filters
Chile Mills
Huntington Mills
Nissen Stamps
Feeders

DU PONT

Explosives Service *Everywhere*



Follows the Demand—

In 1812—
Hauling Powder to Lake Erie.

FOR 118 years it has been our constant aim to deliver explosives where they were needed—and *when* they were needed.

In 1812 our wagon trains delivered the powder to Perry which made possible his immortal victory on Lake Erie. In 1920 our motor trucks are carrying explosives from Du Pont mills and magazines into practically every great industrial district in America to aid production and construction everywhere.

Prompt delivery is but one feature of Du Pont Service. It is our aim to see that our customers use the kind of explosives that will give the best results for their particular work at the least expense—and that they are handled, stored and used most efficiently. Du Pont Service saves hundreds of thousands of dollars every year for our customers.

There is a Du Pont mill or magazine near you. Write us about your problems. It is our business to solve them.

E. I. du Pont de Nemours & Company, Inc.
Sales Dept.: Explosives Division
WILMINGTON, DELAWARE